



**JEPPIAAR**  
**INSTITUTE OF TECHNOLOGY**  
“Self-Belief | Self Discipline | Self Respect”



# QUESTION BANK

Regulation: 2017

Year/Semester: I

Semester: 02

Batch: 2019 - 2023

**DEPARTMENT OF INFORMATION  
TECHNOLOGY**

## **Vision of the Institution**

Jeppiaar Institute of Technology aspires to provide technical education in futuristic technologies with the perspective of innovative, industrial and social application for the betterment of humanity.

## **Mission of the Institution**

- To produce competent and disciplined high-quality professionals with the practical skills necessary to excel

as Innovative professionals and entrepreneurs for the benefit of the society.

- To improve the quality of education through excellence in teaching and learning, research, leadership and

by Promoting the principles of scientific analysis, and creative thinking.

- To provide excellent infrastructure, serene and stimulating environment that is most conducive to learning.

- To strive for productive partnership between the Industry and the Institute for research and development in

the Emerging fields and creating opportunities for employability.

To serve the global community by instilling ethics, values and life skills among the students needed to enrich their lives.

## **Department Vision**

To facilitate the evolution of problem solving skills along with knowledge application in the field of Information Technology, understanding industrial and global requirements for the benefit of the society.

## **Department Mission**

**M1:** Devise students for technical and operational excellence, upgrade them as competent engineers and entrepreneurs for country's development.

**M2:** Develop the standard for higher studies and perpetual learning through creative and critical thinking for the effective use of emerging technologies with a supportive infrastructure.

**M3:** Involve in a constructive, team oriented environment and transfer knowledge to balance the industry-institute interaction.

**M4:** Enrich students with professional integrity and ethical standards that will make them deal social challenges successfully in their life.

## PROGRAMME EDUCATIONAL OBJECTIVES

**PEO1:** To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs.

**PEO2:** To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity.

**PEO3:** To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

## PROGRAM SPECIFIC OBJECTIVES (PSOs)

**PSO 1:** Students are able to analyse, design, implement and test any software with the programming and testing skills they have acquired.

**PSO 2:** Students are able to design and develop algorithms for real time problems, scientific and business applications through analytical, logical and problems solving skills.

**PSO 3:** Students are able to provide security solution for network components and data storage and management which will enable them to work efficiently in the industry.

BLOOM'S TAXONOMY
Definition: Bloom's taxonomy is a classification system used to define and distinguish different levels of human cognition like thinking, learning and understanding.
Objectives:
<ul style="list-style-type: none"> <li>➤ To classify educational learning objectives into levels of complexity and specification. The classification covers the learning objectives in cognitive, affective and sensory domains.</li> <li>➤ To structure curriculum learning objectives, assessments and activities.</li> </ul>
Levels in Bloom's Taxonomy:
<ul style="list-style-type: none"> <li>➤ <b>BTL 1 – Remember</b> - The learner recalls, restate and remember the learned information.</li> <li>➤ <b>BTL 2 – Understand</b> - The learner embraces the meaning of the information by</li> </ul>

interpreting and translating what has been learned.

➤ **BTL 3 – Apply** - The learner makes use of the information in a context similar to the one in which it was learned.

➤ **BTL 4 – Analyze** - The learner breaks the learned information into its parts to understand the information better.

➤ **BTL 5 – Evaluate** - The learner makes decisions based on in-depth reflection, criticism and assessment.

➤ **BTL 6 – Create** - The learner creates new ideas and information using what has been previously learned

### TABLE OF CONTENT

<b>HS8251 – TECHNICAL ENGLISH</b>		
	<b>Syllabus</b>	<b>Page No</b>
I	<b>INTRODUCTION TECHNICAL ENGLISH</b>	<b>1.3-1.15</b>
II	<b>READING AND STUDY SKILLS</b>	<b>1.15-1.19</b>
III	<b>TECHNICAL WRITING AND GRAMMAR</b>	<b>1.19-1.24</b>
IV	<b>REPORT WRITING</b>	<b>1.25-1.32</b>
V	<b>GROUP DISCUSSION AND JOB APPLICATIONS</b>	<b>1.32-1.38</b>

<b>MA8251 – ENGINEERING MATHEMATICS – II</b>		
	<b>Syllabus</b>	<b>Page No</b>
I	<b>MATRICES</b>	<b>2.3- 2.20</b>
II	<b>VECTOR CALCULUS</b>	<b>2.21-2.35</b>
III	<b>ANALYTIC FUNCTIONS</b>	<b>2.36- 2.49</b>
IV	<b>COMPLEX INTEGRATION</b>	<b>2.50- 2.63</b>
V	<b>LAPLACE TRANSFORMS</b>	<b>2.64- 2.82</b>

<b>PH8253 – PHYSICS FOR INFORMATION SCIENCE</b>		
	<b>Syllabus</b>	<b>Page No</b>
I	<b>ELECTRICAL PROPERTIES OF MATERIALS</b>	<b>3.33-3.18</b>
II	<b>SEMICONDUCTOR PHYSICS</b>	<b>3.19-3.33</b>

<b>III</b>	<b>MAGNETIC PROPERTIES OF MATERIALS</b>	<b>3.34-3.45</b>
<b>IV</b>	<b>OPTICAL PROPERTIES OF MATERIALS</b>	<b>3.46-3.49</b>
<b>V</b>	<b>NANO DEVICES</b>	<b>3.50-3.52</b>

<b>IT8201—INFORMATION TECHNOLOGY ESSENTIALS</b>		
	<b>SYLLABUS</b>	<b>PAGE NO.</b>
<b>I</b>	<b>WEB ESSENTIALS</b>	<b>4.2- 4.15</b>
<b>II</b>	<b>SCRIPTING ESSENTIALS</b>	<b>4.16- 4.28</b>
<b>III</b>	<b>NETWORKING ESSENTIALS</b>	<b>4.28- 4.37</b>
<b>IV</b>	<b>MOBILE COMMUNICATION ESSENTIALS</b>	<b>4.37- 4.49</b>
<b>V</b>	<b>APPLICATION ESSENTIALS</b>	<b>4.50- 4.67</b>

<b>CS8251PROGRAMMING IN C</b>		
	<b>SYLLABUS</b>	<b>PAGE NO.</b>
<b>I</b>	<b>BASICS OF C PROGRAMMING</b>	<b>5.3- 5.12</b>
<b>II</b>	<b>ARRAYS AND STRIGS</b>	<b>5.13- 5.23</b>
<b>III</b>	<b>FUNCTIONS AND POINTERS</b>	<b>5.24- 5.34</b>
<b>IV</b>	<b>STRUCTURES</b>	<b>5.35- 5.48</b>
<b>V</b>	<b>FILE PROCESSING</b>	<b>5.49- 5.54</b>

<b>BE8254 – BASIC ELECTRICAL AND INSTRUMENTATION ENGINEERING</b>		
	<b>Syllabus</b>	<b>Page No</b>
<b>I</b>	<b>AC CIRCUITS AND POWER SYSTEMS</b>	<b>6.2- 6.17</b>
<b>II</b>	<b>TRANSFORMER</b>	<b>6.18- 6.42</b>
<b>III</b>	<b>DC MACHINES</b>	<b>6.43- 6.59</b>
<b>IV</b>	<b>AC MACHINES</b>	<b>6.60-6.86</b>
<b>V</b>	<b>MEASUREMENTS AND INSTRUMENTATIONS</b>	<b>6.87- 6.105</b>

JIT-2106

HS8251

<b>L</b>	<b>T</b>	<b>P C</b>
<b>4 0</b>	<b>0</b>	<b>4</b>

**TECHNICAL ENGLISH****Objectives:**

The Course prepares second semester engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

**UNIT I INTRODUCTION TECHNICAL ENGLISH 12**

**Listening**- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** – Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing**- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development**- technical vocabulary **Language Development** –subject verb agreement - compound words.

**UNIT II READING AND STUDY SKILLS 12**

**Listening**- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing**- interpreting charts, graphs- **Vocabulary Development**-vocabulary used in formal letters/emails and reports**Language Development**- impersonal passive voice, numerical adjectives.

**UNIT III TECHNICAL WRITING AND GRAMMAR 12**

**Listening**- Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing**-Describing a process, use of sequence words- **Vocabulary Development**- sequence words- Misspelled words. **Language Development**- embedded sentences

**UNIT IV REPORT WRITING 12**

**Listening**- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing**- email etiquette- job application – cover letter –Résumé preparation( via email and hard copy)- analytical essays and issue based essays-**Vocabulary Development**- finding suitable synonyms-paraphrasing-. **Language Development**- clauses- if conditionals.

**UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 12**

**Listening**- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey **Vocabulary Development**- verbal analogies **Language Development**- reported speech

**TOTAL: 60 PERIODS**

**OUTCOMES:**

At the end of the course learners will be able to

Ver. 3.0

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

**TEXT BOOKS:**

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Black swan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication.** Cambridge University Press: New Delhi, 2016.

**REFERENCES**

1. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.** Oxford University Press: New Delhi,2014.
2. Kumar, Suresh. E. **Engineering English.** Orient Blackswan: Hyderabad,2015
3. Booth-L. Diana, **Project Work,** Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, **English for Presentations,** Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007

**Students can be asked to read Tagore, ChetanBhagat and for supplementary reading.**

	<p><b>Object Code:</b> HS8251                   <b>Year/Semester:</b> I /II  <b>Object Name:</b> TECHNICAL ENGLISH                   <b>Subject Handler:</b> Dr. B. VIDHYA</p> <p style="text-align: center;"><b>UNIT 1: Sharing Information Related To Oneself/Family&amp; Friends</b></p>																																								
	<p><b>Listening-</b> Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- <b>Speaking</b> –Asking for and giving directions- <b>Reading</b> – reading short technical texts from journals- newspapers- <b>Writing</b>- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-<b>Vocabulary Development</b>- technical vocabulary <b>Language Development</b> –subject verb agreement - compound words.</p>																																								
1.	<p style="text-align: center;"><b>PART*A</b></p> <p><b>Technical Vocabulary 2M BTL1</b></p> <table> <tbody> <tr> <td>a.contaminated</td> <td>i.makeeasy</td> </tr> <tr> <td>b. facilitate</td> <td>ii. unclean</td> </tr> <tr> <td>c.renowned</td> <td>iii.Calculate</td> </tr> <tr> <td>d.estimate</td> <td>iv.Famous ( a- ii, b- i, c- iv, d- iii)</td> </tr> <tr> <td>a.narrate</td> <td>i.requirement</td> </tr> <tr> <td>b.necessity</td> <td>ii.cover</td> </tr> <tr> <td>c.muffle</td> <td>iii.envious</td> </tr> <tr> <td>d.jealous</td> <td>iv.Tell (a-iv ,b- i, c- ii, d- iii. )</td> </tr> <tr> <td>a.identical</td> <td>i.joyous</td> </tr> <tr> <td>b.illegible</td> <td>ii.complex</td> </tr> <tr> <td>c.intricate</td> <td>iii.unreadable</td> </tr> <tr> <td>d.jubilant</td> <td>iv.Alike ( a-iv ,b- iii, c- ii, d- i)</td> </tr> <tr> <td>a.gather</td> <td>i.swoon</td> </tr> <tr> <td>b.guilty</td> <td>ii.Accumulate</td> </tr> <tr> <td>c. faint</td> <td>iii.flaw</td> </tr> <tr> <td>d.defect</td> <td>iv.Ashamed (a-ii ,b- iv, c- i, d- iii. )</td> </tr> <tr> <td>a.wage</td> <td>i.definitely</td> </tr> <tr> <td>b.undoubtedly</td> <td>ii.pay</td> </tr> <tr> <td>c.tolerate</td> <td>iii.Amusement</td> </tr> <tr> <td>d.recreation</td> <td>iv.Endure(a-ii ,b- i, c- iv, d- iii. )</td> </tr> </tbody> </table> <p><b>Match the words in Column A with their antonyms in Column B</b></p>	a.contaminated	i.makeeasy	b. facilitate	ii. unclean	c.renowned	iii.Calculate	d.estimate	iv.Famous ( a- ii, b- i, c- iv, d- iii)	a.narrate	i.requirement	b.necessity	ii.cover	c.muffle	iii.envious	d.jealous	iv.Tell (a-iv ,b- i, c- ii, d- iii. )	a.identical	i.joyous	b.illegible	ii.complex	c.intricate	iii.unreadable	d.jubilant	iv.Alike ( a-iv ,b- iii, c- ii, d- i)	a.gather	i.swoon	b.guilty	ii.Accumulate	c. faint	iii.flaw	d.defect	iv.Ashamed (a-ii ,b- iv, c- i, d- iii. )	a.wage	i.definitely	b.undoubtedly	ii.pay	c.tolerate	iii.Amusement	d.recreation	iv.Endure(a-ii ,b- i, c- iv, d- iii. )
a.contaminated	i.makeeasy																																								
b. facilitate	ii. unclean																																								
c.renowned	iii.Calculate																																								
d.estimate	iv.Famous ( a- ii, b- i, c- iv, d- iii)																																								
a.narrate	i.requirement																																								
b.necessity	ii.cover																																								
c.muffle	iii.envious																																								
d.jealous	iv.Tell (a-iv ,b- i, c- ii, d- iii. )																																								
a.identical	i.joyous																																								
b.illegible	ii.complex																																								
c.intricate	iii.unreadable																																								
d.jubilant	iv.Alike ( a-iv ,b- iii, c- ii, d- i)																																								
a.gather	i.swoon																																								
b.guilty	ii.Accumulate																																								
c. faint	iii.flaw																																								
d.defect	iv.Ashamed (a-ii ,b- iv, c- i, d- iii. )																																								
a.wage	i.definitely																																								
b.undoubtedly	ii.pay																																								
c.tolerate	iii.Amusement																																								
d.recreation	iv.Endure(a-ii ,b- i, c- iv, d- iii. )																																								

	A	B
	a. whole	i. common
	b. various	ii.harmful
	c. useful	iii. part
	d. rare	iv. Identical(a-iii,b- i, c- ii, d- iv. )
	a. assist	i. detest
	b. assent	ii. Proud
	c. ashamed	iii. hinder
	d. admire	iv. Dissent(a-iii ,b- iv, c- ii, d- i. )
	a. cautious	i. welcome
	b. banish	ii. Forgetful
	c. barren	iii. polite
	d. impudent	iv. Fertile(a-iv ,b- i, c- ii, d- iii. )
	a. moderation	i. conceal
	b. rapid	ii. Disapprove
	c. reveal	iii. slow
	d. recommend	iv. Greed(a-iv ,b- iii, c- i, d- ii. )
3.	<b>Subject-Verb Agreement2M BTL1</b>	
	<b>Fill in the blanks with the correct verb that agrees with the subject. [BTL3]</b>	
	<p>1. Some of the amazing pictures taken by the contestants _____ (is/are) displayed in the hall.</p> <p>2. He is one of the successful business men who _____ (is/are) sincere and hard working.</p> <p>3. The committee _____ (have/has) carefully studied the proposal for providing loan for the needy.</p> <p>4. The official United Nations website for Peacekeeping_____</p> <p style="margin-left: 40px;">a. (Contain/contains) information on operations around the world.</p> <p>5. Twenty five kilometers _____ (is/are) a long distance to run every day.</p> <p>6. The number of unemployed citizens _____ (are/is) more in developing counties.</p> <p>7. There _____ (are/is) several reasons for implementing the new policy</p> <p>8. The boy who won the two medals_____ (are/is) a friend of mine</p> <p>9. The person who is responsible for planning and implementing aims and objectives of the company _____ (is/are) the manager.</p> <p>10. According to a recent survey, the number of people who opt for purchasing Online.</p>	
	<p><b>II. Choose the correct form of the verb that agrees with the subject.</b></p> <p>(is, are, am, was, were, has, have)</p> <p>1. The price of the jeans <b>is</b> reasonable.</p>	

2. The books borrowed from the library **are** on my desk.
3. Bread and butter **is** our daily food.
4. The quality of the candies **was/is** poor.
5. There **were** ten books in the box.
6. Many a student **were** made the same mistakes.
7. One of the books **has** been missing.
8. Fifty miles **is** a long distance.
9. The poor **are** suffering.
10. One of the most intelligent students **is** John.
11. She and her friends **are** at the fair.
12. The book or the pen **is** in the drawer.
13. The boy or his friends **run** (run) everyday.
14. His friends or the boy **runs** (run) everyday.
15. The committee **decides** (decide) how to proceed.

**4 IV Compound Words 2M BTL1**

**Expand the following Compound Noun**

- |                       |   |
|-----------------------|---|
| 1. Animalbehavior     | -The behavior of an animal                  |
| 2. Aluminumextraction | -The extraction of aluminum                 |
| 3. Batteryvalve       | -Valve of a battery                         |
| 4. Boathouse          | -Boat used as a house                       |
| 5. Butterflyvalve     | -Valve which is in the shape of a butterfly |
| 6. Calculator memory  | -Memory of a calculator                     |

7. Carbondioxide	- Dioxideof carbon
8. Coalgas	- Gas obtained fromcoal
9. Computer language	- Language used for computer operation
10. Computer manual	- Manualfor operatingthecomputer
11. Computertechnology	-Technology usedin computers
12. Datainput	- Inputof data
13. Disk drive	- Driveof a disk
14. Flood damage	- Damage caused byflood
15. Gear mechanism	- Mechanismfor operating thegear
<b>Compound Nouns:</b>	
1. Inflation rate	Rate of inflation
2. Information centre	Centre for giving information
3. Box top	Top of the box
4. Carbon steel rod	Rod made of carbon steel
5. Component location	Location of the component
6. Computer fuel testing	Testing the fuel using the computer
7. Cylinder walls	Walls of the cylinder
8. Drinking water	Water for drinking purpose
9. Engine repair	Repair works related to engine
10. Engine housing	Housing to protect the engine
11. Ferrous oxide	Oxide of ferrous
12. Gear pump	Pump operates by means of gears
13. Language code	Code which specifies the language
14. Paper industry	Industry manufacturing paper
15. Passenger ship	Ship for the purpose of carrying passengers
16. Radar scan	Scan performed by radar
17. Turret lathe	Lathe having a turret
18. Toy factory	Factory for making toys

5	<p><b>Purpose Statement:2M BTL2</b></p> <ol style="list-style-type: none"> <li>1. A barometer <b>is used to</b> measure atmospheric pressure.</li> <li>2. Another way of expressing purpose is shown in the following sentences.</li> <li>3. <b>The purpose of</b> painting iron parts <b>is to protect</b> them from rust.</li> <li>4. <b>The purpose of</b> a thermostat <b>is to maintain</b> temperature at a constant level</li> <li>5. <b>The aim of</b> the test <b>is to predict</b> the rise in pressure.</li> </ol> <p><b>Use the hint below to make sentences expressing purpose(Use any of the patterns illustrated above)</b></p> <ol style="list-style-type: none"> <li>1. <b>An aerial:</b> receives broadcast signals. An aerial is used to receive broadcast Signals</li> <li>2. <b>A feasibility report:</b> makes recommendations on the practicality of a project A feasibility reports is used to make recommendation on the practicality of a project</li> <li>3. <b>Sending telegrams:</b> ensures that the message reaches the address quickly. Sending telegrams are used to ensure that the messages reached the address quickly.</li> <li>4. <b>An experiment:</b> demonstrates a principle An experiment is used to demonstrate a principle</li> <li>5. <b>Constructing a bypass road:</b> reduces traffic congestion in a city. Constructing a bye-pass road is used to reduce traffic congestion in a city.</li> <li>6. <b>A sheet of carbon paper:</b> makes copies while one types. A sheet of carbon paper is used for making copies while one types</li> <li>7. <b>A litmus test:</b> identifies acids an alkalies. A litmus test is used for identifying alkalies.</li> <li>8. <b>A flow chart:</b> represents a process as a series of steps. A flowchart is used for representing a process as a series of step.</li> <li>9. <b>A calculator:</b> calculates with numbers A calculator is used for calculating numbers</li> <li>10. <b>A life Boat:</b> rescues people who are in danger at Sea ALife boat is used for rescuing people who are in danger at Sea</li> <li>11. <b>A Compass:</b> Finds direction A compass is used for finding direction</li> <li>12. <b>Robot:</b> do Heavy and dangerous jobs. Robot is used for doing heavy and dangerous jobs.</li> <li>13. <b>A Satellite:</b> Collects information for communication A satellite is used for collecting information for communication.</li> <li>14. <b>A glass bottle :</b> stores acid.</li> </ol>

	<p>A Glass bottles is used for storing acids.</p> <p><b>15. A moderator: slows down the speed of free neutrons</b></p> <p>A moderator is used to slow down the speed of free neutron.</p>
	<p><b>Extended Definition:2M BTL2</b></p> <p>Example : 1</p> <p>(<i>Sentence definition</i>) We can define an <b>SUV</b> as a vehicle which is usually driven on rough terrain.</p> <p>(<i>Illustration</i>)SUV is an acronym which stands for <b>sports utility vehicle</b>. (<i>Description</i>)The engines of the SUV vehicles supply power to all four wheels, so they are better for cruising sand dunes.</p> <p>(<i>Classification</i>) SUV vehicles vary in size; some of them can seat 5 passengers, while others can seat 7 passengers. (<i>causal analysis</i>) SUV vehicles are quite common in Saudi Arabia due to the low cost of petrol and their fantastic performance in the desert.</p> <p>Example : 2</p> <p>(<i>Sentence definition</i>)<b>The periodic table</b> can be defined as an organized array of all the chemical elements in order of the atomic weight. (<i>Illustration</i>)The elements show a periodic recurrence of certain properties. (<i>Chronology</i>)It was first discovered in 1869 by Dmitry I. Mendeleev.</p> <p>(<i>Description</i>)Those in the same column or group of the table as usually arranged have similar properties. (<i>Chronology</i>)In the 20th century, when the structure of atoms was understood, the table was seen to precisely reflect increasing order of atomic number. (<i>Description</i>) Members of the same group in the table have the same number of electrons in the outermost shells of their atoms and form bonds of the same type.</p> <p>Example : 3</p> <p>(<i>Sentence definition</i>)Glass is a hard transparent material which is used to make windows, bottles and other objects. (<i>Etymology</i>) glass is an English word and was first used before the twelfth century.</p> <p>(<i>Chronology</i>)Glass has been used as a decorative object indoors since ancient times. Today, glass is widely used in the construction and telecommunication sectors. (<i>Description</i>) It is made by cooling molten ingredients such as silica sand with sufficient rapidity to prevent the formation of visible crystals.</p> <p>Example :4</p> <p>Appropriate technology is that technology which is affordable within the resources available, is culturally acceptable and is environmentally harmless.</p>
	<b>PART *B</b>
1.	<p><b>INSTRUCTION16M BTL3</b></p> <p><b>1. To control noise pollution: (May/Jun 2011)</b></p> <ol style="list-style-type: none"> <li>1. Prohibit noise producing vehicles</li> <li>2. Avoid using high sounding crackers</li> </ol>

3. Don't use loud speakers near schools and hospitals.
4. Use a silencer to absorb noise of the vehicle
5. Establish industrial units away from residential areas
6. Plant trees to absorb noise.
7. Live away from the airport
8. Avoid using high sounding pressure horns
9. Be aware of noise pollution

**2. To reduce unemployment problem:**

1. Ensure employment to at least one person in a family
2. Increase the number of technical training institutes
3. Give loans to encourage self-employment
4. Give subsidies to encourage the entrepreneurs
5. Employ unemployed graduates for additional government duties like election duties
6. Encourage private sectors to generate employment.
7. Establish more industries in rural areas
8. Train the graduates to start small scale industries

**3. To keep the college campus clean:**

1. Keep the environment always clean
2. Plant trees in the college campus
3. Conduct awareness classes to make the students to realise the importance of cleanliness.
4. Place more number of dust bins in the campus
5. Impose punishment on those who violate the rules
6. Maintain the vehicles properly
7. Avoid cutting of trees in the name of development
8. Always maintain strict discipline

**4. To maintain a computer / a laptop in good working condition (Jan 2006; May/Jun 2007; Jan 2010)**

1. Don't touch the cables
2. Avoid touching the open sockets
3. Avoid touching the monitor
4. Always shut down the system when it is not in use.
5. Shut down the system properly.
6. Don't misplace and replace the equipment.
7. Don't handle the equipment roughly.
8. Don't keep your legs on the UPS.

**5. Safety instructions in a chemical engineering lab (Jan 2010)**

1. Don't work in the laboratory barefoot.
2. Don't handle the instruments roughly.
3. Don't wear gold ornaments.
4. Keep all the doors and windows open.
5. Keep your working place neat and tidy.
6. Don't wear loose clothes.
7. Wear apron and gloves while handling the chemicals.

8. Handle all glassware items carefully.
9. Don't drink or eat in lab.
10. Don't taste or sniff chemicals.
11. Identify the safety equipment.
12. Read the chemical safety instructions.

**6. Instructions must be followed by all pedestrians (Road safety)**

1. Walk on the pavement always.
2. Use subways; though it is long.
3. Avoid crossing suddenly.
4. Don't walk on road dividers.
5. Don't ignore traffic signals.
6. Cross the road only at zebra crossing.
7. Make sure that the road is clear, before crossing the road.
8. Avoid using the cell phone while walking along the road.
9. Be familiar with the traffic rules.

**7. Instructions to save petrol (May / Jun 2012)**

1. Keep the engine in good condition
2. Fit the vehicle with an engine that gives high mileage.
3. Don't keep the engine running while the vehicle is not in motion.
4. Inflate the tyres at an optimum level of air pressure.
5. Use the correct engine oil for the proper functioning.
6. Service the vehicle regularly.
7. Avoid clutch driving.
8. Avoid frequent change of gear to save petrol.

**8. Instructions to maintain two/four wheelers in good working condition (May/Jun 2005/2006)**

1. Always maintain the air pressure in the tyre to the recommended levels.
2. Drive only at optimum level of speed depending on the roads.
3. Clean the air-filter regularly since clogged air filters increase fuel consumption.
4. Do not idle the engine not more than 30 seconds to warm it up when starting.
5. Avoid sudden breaks and frequent gear changing.
6. Handle the gear, brake and clutch softly.
7. Service the vehicles regularly for better performance as well as fuel saving
8. Always maintain the lubricants at the required level to ensure running of the engine.
9. Avoid pressure horns.
10. Avoid faulty silencers.

**9. Write eight instructions to preserve environment. (May 2004/2005)**

1. Reduce the usage of plastic
2. Use the eco-friendly papers made out of alternative sources.
3. Use rechargeable batteries for frequent usages to reduce the number of dead batteries
4. Use natural fertilizers and pesticides for agriculture.
5. Don't cut trees.
6. Plant native and adaptive trees.

7. Turn light off at office as well as at home whenever it is not needed.
8. Treat sewage and industrial effluents before discharging into the water bodies.
9. Conduct awareness programmes for preserving the environment.
10. Encourage rain water harvesting.

#### **10. Instructions for giving first aid to a victim of a road accident**

1. Check the victim thoroughly whether the victim is breathing or not
2. Take the victim to the side of the road.
3. Try to stop the bleeding by applying pressure on the bleeding side.
4. Give artificial respiration if the victim is struggling for breathe.
5. Don't crowd round the victim and prevent airflow.
6. Handle the victim carefully.
7. Examine the head, eyes, nose, ears, chest, and abdomen to detect wounds.
8. Ask the victim to move the toes, and fingers to check their movements or function.
9. Take the victim to the hospital

#### **II Checklists 16M BTL2**

##### **1.Checklist for an Interview**

1. Have I taken the ticket?
2. Have I taken the certificates?
3. Have I taken the call letter?
4. Have I taken money?
5. Have I arranged the certificates properly?
6. Have I taken my project report?
7. Have I taken my friends' contact number?
8. Have I packed the formal wear?

**Yes      No**

<input type="checkbox"/>	<input type="checkbox"/>

##### **2. Checklist for an Industrial Visit**

1. Have I taken the ticket?
2. Have I taken money?
3. Have I taken the conformation letter?
4. Have I taken all the documents?
5. Have I taken my Identity Card?
6. Have I taken my cell phone and charger?
7. Have I packed the formal wear?
8. Have I taken my friends' contact number

**Yes      No**

<input type="checkbox"/>	<input type="checkbox"/>

	<b>3. Checklist for conducting a two day conference</b>	<b>Yes</b>	<b>No</b>
1.	Have I sent the invitations?	<input type="checkbox"/>	<input type="checkbox"/>
2.	Have I invited the chief guest?	<input type="checkbox"/>	<input type="checkbox"/>
3.	Have I invited the Principal and staffs?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Have I prepared the welcome address?	<input type="checkbox"/>	<input type="checkbox"/>
5.	Have I prepared the agenda?	<input type="checkbox"/>	<input type="checkbox"/>
6.	Have I arranged the conference hall?	<input type="checkbox"/>	<input type="checkbox"/>
7.	Have I arranged enough refreshments?	<input type="checkbox"/>	<input type="checkbox"/>
8.	Have I made the stage ready?	<input type="checkbox"/>	<input type="checkbox"/>
<b>4. Checklist for organizing a Paper Presentation session</b>	<b>Yes</b>	<b>No</b>	
1.	Have I arranged the venue?	<input type="checkbox"/>	<input type="checkbox"/>
2.	Have I finalized the papers?	<input type="checkbox"/>	<input type="checkbox"/>
3.	Have I fixed the judges?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Have I arranged for refreshment and lunch for delegates?	<input type="checkbox"/>	<input type="checkbox"/>
5.	Have I purchased the kits?	<input type="checkbox"/>	<input type="checkbox"/>
6.	Have I prepared the certificates?	<input type="checkbox"/>	<input type="checkbox"/>
7.	Have I prepared the agenda?	<input type="checkbox"/>	<input type="checkbox"/>
8.	Have I prepared the welcome address?	<input type="checkbox"/>	<input type="checkbox"/>
9.	Have I informed the participants?	<input type="checkbox"/>	<input type="checkbox"/>
<b>5. Checklist for one day Training Programme in Delhi</b>	<b>Yes</b>	<b>No</b>	
1.	Have I reserved the tickets?	<input type="checkbox"/>	<input type="checkbox"/>
2.	Have I taken the money?	<input type="checkbox"/>	<input type="checkbox"/>
3.	Have I taken the dresses?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Have I taken the Laptop?	<input type="checkbox"/>	<input type="checkbox"/>
5.	Have I taken the documents?	<input type="checkbox"/>	<input type="checkbox"/>
6.	Have I taken the notes for training?	<input type="checkbox"/>	<input type="checkbox"/>
7.	Have I taken the confirmation letter?	<input type="checkbox"/>	<input type="checkbox"/>
8.	Have I taken the venue address?	<input type="checkbox"/>	<input type="checkbox"/>
	<b>Recommendations 16M BTL3</b>		
I.	Recommendations to preserve our water resources:-		
1.	It is recommended to observe rain water harvesting by all.		
2.	It is important to control sand smuggling.		

3. It is necessary to construct rain water storage tanks.
4. It is recommended to encourage the people for afforestation.
5. It is essential to conduct awareness programmes.
6. It is advised to plant native and adaptive plants.
7. It is recommended to water gardens and fields early in the morning to avoid evaporation.
8. It is highly recommended to recycle the water.

## **II. RECOMMENDATIONS**

1. Write a set of eight recommendations to preserve our water resources.

**Ans:** Title : Recommendations to preserve our water resources:-

9. It is recommended to observe rain water harvesting by all.
10. It is important to control sand smuggling.
11. It is necessary to construct rain water storage tanks.
12. It is recommended to encourage the people for a forestation.
13. It is essential to conduct awareness programmes.
14. It is advised to plant native and adaptive plants.
15. It is recommended to water gardens and fields early in the morning to avoid evaporation.
16. It is highly recommended to recycle the water.

2. Power cut is a major problem in southern parts of India and it badly affects small scale industries. Write a set of eight recommendations to ensure continuous power supply to the small scale industries. **(AUC DEC-JAN 2016)**

**Ans:** Title : Recommendation to ensure continuous power supply to small scale industries

1. It is recommended that UPS may be installed.
2. It is recommended to create general awareness among public and educate them to save energy resources.
3. It is recommended to introduce feasible solar systems as an alternative source of energy.
4. It is recommended to take adequate measures to implement plants to generate power through pedal power.
5. It is recommended to learn to conserve electricity.
6. It is recommended to use net metering technology which is eco-friendly and economical.
7. It is recommended to tap more alternative sources.
8. It is recommended to generate bio mass power.

3. Write a set of eight recommendations to reduce unemployment problem.

**Ans:** Title : Eight recommendations to reduce unemployment problem.

1. It is recommended that the government can increase the number of technical training institutes.
2. It is recommended to give loans to encourage self-employment.

3. It is recommended to introduce entrepreneurship courses in the school and college curriculum.
4. It is recommended to give subsidies to encourage the entrepreneurs.
5. It is recommended to start more industries in rural and suburban areas.
6. It is recommended to encourage private sectors to generate employment.
7. It is recommended that the government can ensure employment to at least one person in a family.
8. It is recommended to employ the unemployed graduates for additional government duties like elections duties etc.

4. There are many social problems such as poverty and hunger in India, which need to be solved. Write a set of eight recommendations to solve these problems.

Ans : Title : Eight recommendations to solve social problems such as poverty and hunger in India

1. It is recommended that the government can measures to increase exports.
2. It is recommended to concentrate on the development of the small scale industries.
3. It is recommended to provide loans for small business in rural areas.
4. It is recommended to create livelihood opportunities for the poor and the needy by the state government.
5. It is recommended that the charitable institutions can support the government to eradicate hunger and poverty.
6. It is recommended that the multinational companies can be encouraged to start business for the increase of job opportunities and income.
7. It is recommended that the children suffering from malnutrition can be adopted by social organizations.
8. It is recommended to take necessary steps to monitor whether the deserving people are benefitted of the services provided for them.

5. Write a set of eight Recommendations to make environment clean and less polluted.

Ans : Title : Eight recommendations to make environment clean and less polluted.

1. It is recommended to use renewable resources which can be replenished.
2. It is recommended to start replenish forests for producing raw materials and increasing the area under forest.
3. It is recommended to ban killing or poaching of animals.
4. It is recommended to preserve natural habitat for animals.
5. It is recommended to monitor and survey the maintenance of greenery around by the concerned officials.
6. It is recommended to encourage growing of more trees.
7. It is recommended to stop using plastics and burning of it.
8. It is recommended to use eco-friendly appliances and gadgets.

6. Write a set of eight recommendations for selecting a proper fuel.

Ans : Title : Eight recommendations for selecting a proper fuel.

1. It is recommended to select such a fuel which can burn easily.
2. It is recommended to select the fuel which produces sufficient energy.
3. It is recommended to select the fuel which is available in plenty.
4. It is recommended to select the fuel for which the storage is easy and safe.
5. It is recommended to select such a fuel which does not pollute the air on burning.
6. It is recommended to select a fuel which does not leave behind much residue.
7. It is recommended to select a fuel for which the transportation is easy and safe.
8. It is recommended to select an inexpensive fuel.

#### **UNIT II      READING AND STUDY SKILLS 12**

**Listening-** Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing-  
**Writing**- interpreting charts, graphs- **Vocabulary Development**-vocabulary used in formal letters/emails and reports  
**Language Development**- impersonal passive voice, numerical adjectives.

#### **PART\*A**

#### **Impersonal Passive 2M BTL1**

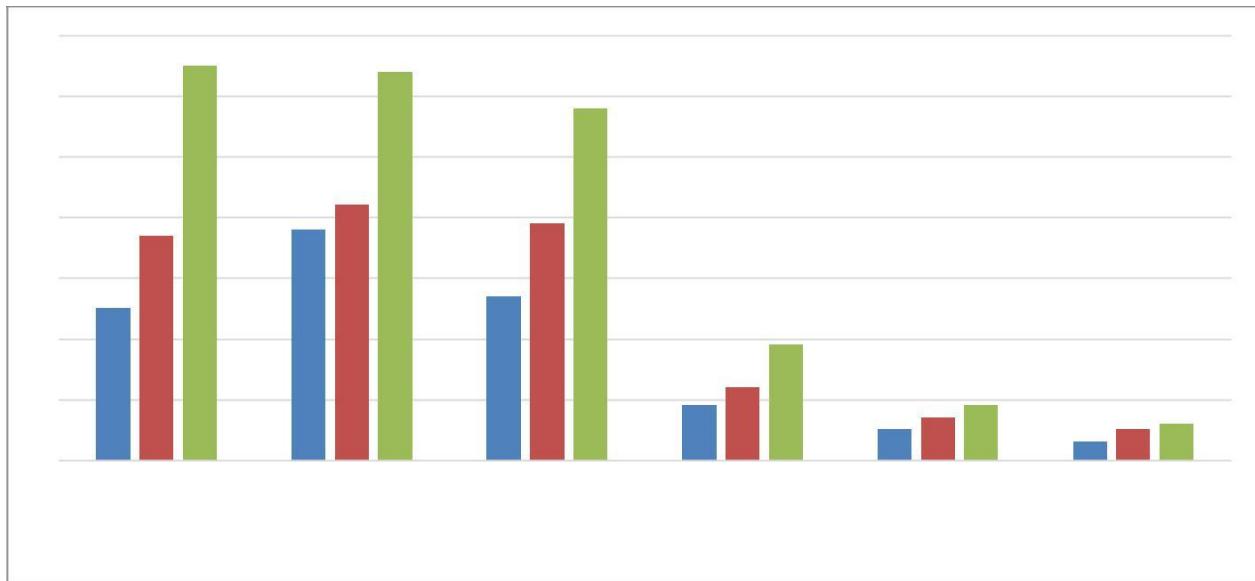
1. **The company had manufactured high powered engines.**  
High powered Engines had been manufactured
2. **One can easily solve this problem.**  
This problem can be solved
3. **Users have maintained this pump themselves.**  
This pump has been maintained
4. **The men are laying roads in many parts of the city.**  
Roads have been laid in many parts of the city.
5. **The Cricket Board men offer to give 1400 transmitters.**  
1400 transmitters have been offered.
6. **They will start production on the new type of reactor soon.**  
New type of reactors production will soon be started.
7. **We pass an electric current across the electrodes**  
An electric current will be passed across the electrode.
8. **The workers are repairing the bridge.**  
The bridge is being repaired.
9. **We can cast this metal into very complicated shapes.**  
This metal can be casted into very complicated shapes

#### **Write the sentence into Passive form 2M BTL1**

	<ol style="list-style-type: none"> <li>1. I can answer the question- The question can be answered by me.</li> <li>2. She would carry the box. – The box would be carried by her.</li> <li>3. You should open the window – The window should be opened by you.</li> <li>4. We might play cards. - Cards might be played by us.</li> <li>5. You ought to wash the car. – The car ought to be washed by you.</li> <li>6. He must fill in the form. – The form must be filled in by him.</li> <li>7. They need not buy bread. – Bread need not be bought by them.</li> <li>8. He could not read the sentence. - The sentence could not be read by him.</li> <li>9. Will the teacher test our English? - will our English be tested by the teacher?</li> <li>10. Could jenny lock the door? – Could the door be locked by jenny?</li> </ol>
<b>II</b>	<b>Numerical Adjectives. 2M BTL1</b> <p><b>Rewrite the following as numerical expressions</b></p> <ol style="list-style-type: none"> <li>1. A flask with a capacity of 10 liters- A 10 liter flask</li> <li>2. A journey of 20 miles- A 20 mile journey</li> <li>3. A squad of 1000 men- A 1000 men squad</li> <li>4. A civilization which is 2000 years old- 2000 year old civilization</li> <li>5. A project of 10 years- A 10 year project.</li> <li>6. A match lasting five days- A five day Lasting match.</li> <li>7. At intervals of 10 minutes- A 10 minute interval</li> <li>8. A DC supply of 240 volts- A 240 volt DC supply</li> <li>9. A lamp of a power of 60 watts- A 60watts power Lamp.</li> <li>10. An investment of Rs. 3, 50,000- A 3, 50,000investment.</li> <li>11. A book in six volume – a 6 volume book</li> <li>12. An engine with 100 cc power – a 100 cc power engine</li> <li>13. A walk of five kilometers – A 5 kilometer walk</li> <li>14. A drive for 8 hours – A 8 hour drive</li> <li>15. A committee of 6 members – A 6 member committee</li> <li>16. A rope with a length of 5 meters – A 5 meter rope</li> <li>17. A can with a capacity of 25 liters – A 25 liter tank</li> <li>18. A training programme for 25 days - A 25 day training programme</li> </ol>

	<p>19. An auditorium of 1000 capacity – A 1000 capacity auditorium</p> <p>20. A pen drive with 16 GB storage. – A 16 GB pen drive</p> <p>21. A lab with 30 computers – A 30 computer lab</p> <p>22. The pipe is 3 feet long – A 3 foot pipe</p> <p>23. A colony with 200 houses – A 200 house colony</p> <p>24. A road measuring 100 feet – A 100 foot road</p> <p>25. A video running for 40 seconds– A 40 second video.</p>
	<p><b>Interpreting charts and graphs.16M BTL-4</b></p> <p><b>Look at the following information and graph about the pass percentage of the students in the plus two examination. Analyze the given data and write a short review of the pass percentage of the student in a paragraph of not more than 120 words:</b></p> <p>About John Higher Secondary School</p> <p>This school was started in a village to cater to the needs of the poor people.</p> <p>In 2011, many experienced teachers left the school .</p> <p>After reviewing the low performance of the students in the plus-two examination, the infrastructure facilities were improved and teachers were given adequate training to teach their subjects effectively</p> <p>Besides, the management has started giving special incentives to the teachers who give cent percent results in the examination.</p>

**II. The following chart represents the arrival of tourists from different regions. Analyze the given data and write a paragraph:**

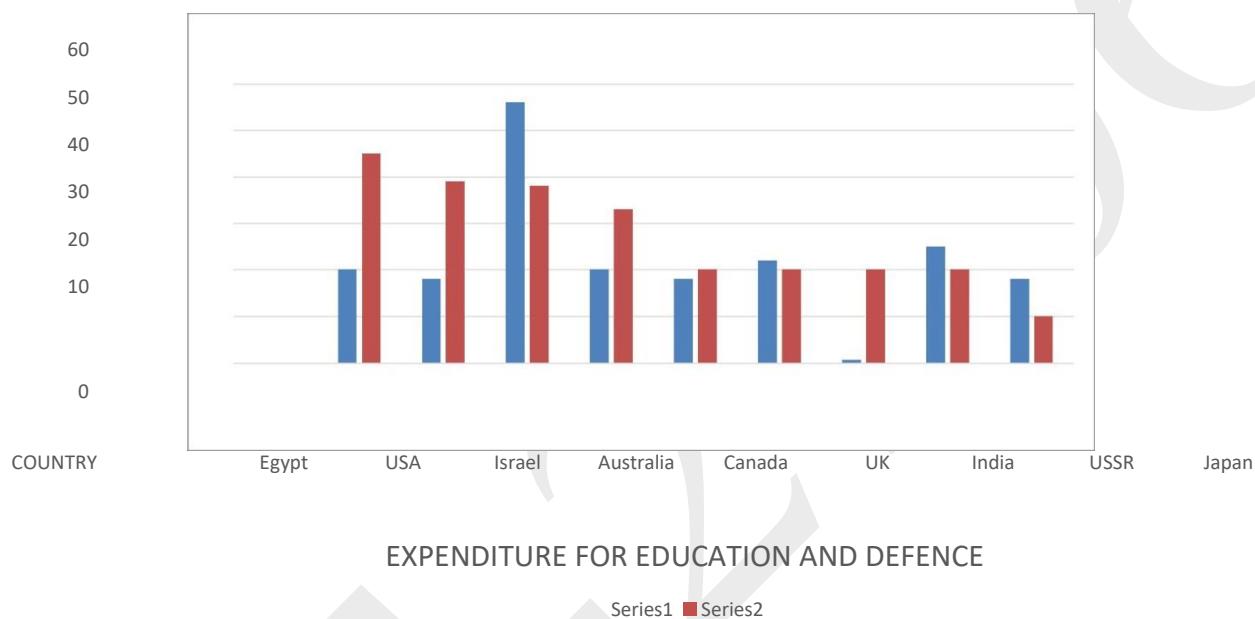


□		2012	2.5	3.8	2.7	0.9	0.5	0.3
□		2013	3.7	4.2	3.9	1.2	0.7	0.5
□		2014	6.5	6.4	5.8	1.9	0.9	0.6

**X- axis – Tourists arrival from region of origin**

**Y-axis- Tourists who visited India in millions**

Look at the following bar chart which describes the expenditure on education and defense of the total expenditure incurred by different countries. Write a paragraph presenting the information contain in it using expressions of comparison.



### Unit-III

#### TECHNICAL WRITING AND GRAMMAR 12

**Listening-** Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing**-Describing a process, use of sequence words- **Vocabulary Development**- sequence words- Misspelled words. **Language Development**- embedded sentences

	PART*A
1.	<b>I. Sequence Words 2M BTL1</b> Fill in the blanks with appropriate sequence words.

1. Half an hour passed, but there was no sign of bus. -----, we decided to go home.
2. The documents will be scrutinized by the bank officials. ----- they will sanction the loan.
3. To reduce weight, -----create rigorous exercise.
4. When air conditioner is used reversed. -----reverse mechanism, hot air is propelled toward indoor and cool air towards outdoor.
5. How can you lay two audio tracks ----- in Windows Live Movie Maker?
6. ----- you buy a new layout you should decide on what you really need.
7. In the process of making chocolates, firstly the cocoa beans are finely ground. -----, it is mixed with cocoa butter and sugar and then smoothened.
8. Cheese is a concentrated source of many of the nutrients in milk. ----the usual cheese making process, the amount of various nutrients retained depends on the
  - (a) Then press the "Send" option.
  - (b) Next type your message and add "smileys" or images, if you want.
  - (c) To begin with, go to "messages"
  - (d) After that "Add" the contact number of the recipient.
9. (a) Then, the tea water is filtered and is served with sugar cubes.
10. (b) First, water is taken in a kettle and is allowed to boil.
11. (c) After that, the decoction is allowed to settle down.
12. (d) Next, tea leaves are added to the boiling water.
13. (a) First, the clothes and soap powder are put in the respective slots.
14. (b) Water is drawn repeatedly as per requirement to wash and rinse.
15. (c) When the start button is pressed the machine starts to draw water from the tap and the operation starts after the tank is full.
16. (d) Finally clothes are dried.
17. (a) The image is charged with electricity.
18. (b) The document for taking photocopy is kept in the machine.
19. (c) Then, an ink powder called toner sticks to the charged parts of the image and is transferred onto paper.
20. (d) Secondly, a bright light reflects the image of the document onto a plate or drum.

	<p>(a) After you enter your information, click "Sign Up"</p> <p>(b) On here you will need to enter your information.</p> <p>(c) Towards the right side of the screen you will see a "sign up" screen.</p> <p>(d) Go to <a href="http://www.facebook.com">www.facebook.com</a>.</p>
3.	<p><b>Misspelt word 2M BTL3</b></p> <p><i>Correct the spelling of the misspelt words.</i></p> <ol style="list-style-type: none"> <li>1. Occasion- occasion</li> <li>2. Committee- Committee.</li> <li>3. Tomorrow- tomorrow</li> <li>4. Charactar- Character.</li> <li>5. Greatful- Grateful</li> <li>6. Neessary- Necessary</li> <li>7. Sychology- Psychology</li> <li>8. recieve -receive</li> <li>9. leisue- Leisure.</li> <li>10. Apetite- Appetite</li> <li>11. Careulness-Carefulness</li> <li>12. Exceled- Exceled</li> <li>13. Prohiited- Prohibited</li> <li>14. Groupped- grouped</li> <li>15. Earnned- Earned.</li> <li>16. Transmited- Transmitted.</li> <li>17. Aloted- Allotted</li> <li>18. Refering- Referring</li> <li>19. Traping- Trapping</li> <li>20. Stimulated- Stimulated</li> </ol>
4.	<p><b>Embedded Sentences</b> <span style="float: right;"><b>[BTL2]</b></span></p> <p><b>Complete the following sentences with appropriate Embedded Clauses</b></p> <ol style="list-style-type: none"> <li>1. The music, _____ gave me a headache.</li> <li>2. The old lady, _____ waited for a taxi.</li> <li>3. The bus, _____ sped down the street.</li> <li>4. The loaf of bread, _____ was spoilt.</li> <li>5. The singer, _____ was the chief guest on our College Day.</li> </ol>

	<p>6. The child, _____ was crying in the super market</p> <p>7. The airplane, _____ finally landed at the airport</p> <p>8. The elderly man, _____ struggled to cross the road</p> <p>9. The astronaut, _____ was received warmly at the airport.</p> <p>10. The boy, _____ is from our college</p>
	<b>PART *B</b>
	<p>I. Describing a process 16 BMTL-4</p> <ol style="list-style-type: none"> <li>1. Describe the process involved in opening a bank account.</li> <li>2. Describe the process of mending the puncture tube of your two-wheeler.</li> <li>3. Describe the process involved in making a cup of tea.</li> <li>4. Describe the process involved in sending an email attachment to your friend.</li> <li>5. Describe the process involved in becoming successful orator.</li> <li>6. Describe the process involved in making a glass of lemon juice</li> </ol> <p><b>Process:</b>  Explanation in a paragraph or two-  Presentation -4  Content – 8  Sentence format- 4</p>
	<p>Reading Comprehension</p> <p>(a) Read the following passage carefully and answer the questions below it:</p> <p>The latest buzz word in the continuing debate about the environment is “sustainable management”- that means using plants and animals for our benefit, but ensuring that enough is left alive to guarantee the survival of the species. This sounds good, but is it practical in reality? In spite of years of scientific research, no one really knows how much damage human beings are doing to their environment. We know that, they are responsible for many problems ranging from global warming to ozone depletion, and there is no doubt that they have a devastating effect on animal and plant life on earth. About 50,000 animal and plant species are becoming extinct every year. All species depend on some way on one another for survival. If you remove one species from this complex web of inter relationships, we have little idea of the repercussions on the ecosystem in general. What makes things more complicated is the fact that unlike global warming - which, if the political will was there, could be reduced by cutting gas emissions - preserving bio diversity- remains a difficult dilemma. There are also questions about whether sustainable management is practical as far as protecting areas of great bio-diversity such as the world’s tropical forest are concerned. In theory, the principle should be to cut a number of trees, but not so many as to completely destroy the forest.</p>

Sustainable Management of trees requires controls on the number of trees which are cut down as well as investment replacing them. Most tropical forests exist in poor countries which depend on logging to make money. Foremost loggers in these countries, making money means cutting down as many trees as

Possible in the shortest time. The price of trees remains stable, varying by 4-5% annually, whereas the interest rates in most developing countries can create 15% or more in returns. It therefore makes little sense, and certainly no economic sense, to

Delay tree felling. One solution could be to insist that wood comes from sustainable managed forests. In theory, consumers would buy only this wood and force logging companies to go “green” or else out of business. Unfortunately, unrestricted logging is more profitable than wood from sustainable managed forests which would cost up to 5 times more to control. Consumers would not be prepared to pay the extra sum just to protect the environment. The sad fact is that there is no practical solution to protect vegetation and wildlife of tropical forests in the future. It is estimated that these forests contain anything from 50-90 percent of all animal and plant species of the earth. In one study of kilometer square area of rain forest in Peru, for example, scientists counted 1300 species of butterfly and 600 species of birds. In the entire USA only 400 species of butterfly and 700 species of birds have been recorded. Sustainable Management represents gigantic experiment. If this doesn’t work, we can’t move to another planet to escape. It is a case of one planet, one experiment!

Complete the following statements choosing from one of the given alternatives

(i) The extent of the damage being inflicted on our environment.....

1. can be estimated by years of scientific research.
2. is being calculated by scientific research exactly.
3. is impossible to assess despite years of scientific research.
4. is thanks to years of scientific research, on the decrease.

(ii) The term “Sustainable Management” means using plants and animals for our own benefit, but.....

1. assuring none are left alive to guarantee the survival of the species.
2. making sure that enough are left alive to guarantee survival of the species.

The newlyweds agreed to be very ***frugal*** in their shopping because they wanted to save enough money to buy a house.

### 1. economical

	<p>2. wasteful 3. interested</p>
	<p>Although Alex usually looks <u>unkempt</u>, he had a very neat appearance at his job interview.</p> <ol style="list-style-type: none"> <li>1. orderly</li> <li>2. handsome</li> <li><b>3. messy</b></li> </ol>
<b>5.</b>	<p>Paragraph writing 16M BTL3</p> <ol style="list-style-type: none"> <li>1. Write two paragraphs comparing the newspaper and the television as media of mass communication. Each of the paragraphs should not exceed 200 words.</li> <li>2. Write two paragraphs, one describing the benefits of technology the other describing the drawbacks of technology. Each paragraph should not exceed 200 words.</li> <li>3. Imagine yourself to be in the year 2050 and you are in your early 70's. The fuel position is very bad. Describe how life was fifty years ago when fuel was easily available. Write this in about 170-200 words.</li> <li>4. Describe in about 170-200 words the utility, function with advantages and disadvantages of a washing machine.</li> <li>5. Imagine yourself to be living in the year 2050 and you are in your early 70's. The fuel position is very bad. Describe how life was fifty years ago when fuel was easily available. Write this for about 170- 200 words.</li> <li>6. Write two paragraphs, one describing the advantages and disadvantages of Mass media.</li> <li>7. Write a paragraph on Population explosion.</li> <li>8. Write a paragraph on Information Technology in India.</li> </ol> <p>Content- 6      Sentence completion 2      Grammar/ spellings 4      Presentation 4</p> <ol style="list-style-type: none"> <li>a. The importance of social media in today's world.</li> <li>b. Donate blood and save lives.</li> <li>c. Student's approach to library in the current scenario.</li> <li>d. Going away from nature is happening naturally- Discuss.</li> <li>e. Outdoor and Indoor Games.</li> </ol>
<b>6.</b>	<ol style="list-style-type: none"> <li>1. Objective/ Multiple type: 1 per question</li> <li>2. True or False: 1m/ Question</li> <li>3. Short note: 2m if any</li> </ol>

UNIT IV	REPORT WRITING	12
<b>Listening</b> - Listening to documentaries and making notes. <b>Speaking</b> – mechanics of presentations- <b>Reading</b> – reading for detailed comprehension- <b>Writing</b> - email etiquette- job application – cover letter –Résumé preparation( via email and hard copy)- analytical essays and issue based essays- <b>Vocabulary Development</b> -		

finding suitable synonyms-paraphrasing-. <b>Language Development- clauses- if conditionals.</b>	
<b>Sr.N o</b>	<b>PART* A</b>
<b>1</b>	<p><b>Clauses- If conditional2M BTL2</b></p> <ol style="list-style-type: none"> <li>1. If he communicates effectively, <b>he will get selected.</b></li> <li>2. If he had performed well, <b>he would have passed</b></li> <li>3. If I got up earlier, <b>I would catch the train.</b></li> <li>4. If the new material had come in time, <b>we would have transferred the goods.</b></li> <li>5. If you planned well, <b>you could finish the project.</b></li> <li>6. If I had a net connection, <b>I would send the email.</b></li> <li>7. If I were you, <b>I would enjoy the trip.</b></li> <li>8. If you went for a walk every day, <b>you would maintain your health well.</b></li> <li>9. If people follow traffic rules, <b>the city can avoid traffic congestion.</b></li> <li>10. If you practised hard, you <b>would pass</b> (pass) the exam easily.</li> <li>11. If the traffic rules are followed, there ----- <b>will be</b> ----- (be) very less accidents.</li> <li>12. If I drop this, it _____ <b>will explode</b> _____ (explode).</li> <li>13. If I had seen you, I <b>would have invited</b> (invite) you.</li> <li>14. If the child goes out in the rain, it _____ (catch) cold. <b>Ans : will catch</b></li> <li>15. If I were an astronaut, I _____ (visit) the space station. <b>Ans : would visit</b></li> <li>16. If the boys do not practice, they _____ (lose) in the finals. <b>Ans : will lose</b></li> <li>17. If there had been good rains, the corps _____ (grow) well. <b>Ans : would have grown</b></li> <li>18. If I get a new job, _____ <b>Ans : If I get a new job, I will take my family to a holy place for prayer.</b></li> <li>19. _____, she would have completed her journey. <b>Ans : If Rita has joined the crew, she would have completed her journey.</b></li> </ol>
<b>3</b>	<p><b>PART* B</b></p> <p><b>Ten Quick Tips on Writing a Professional Email 16M BTL3</b></p> <ol style="list-style-type: none"> <li>1. Always fill in the subject line with a topic that means something to your reader. Not "Decals" or "Important!" but "Deadline for New Parking Decals."</li> <li>2. Put your main point in the opening sentence. Most readers won't stick around for a surprise ending.</li> <li>3. Never begin a message with a vague "This." ("This needs to be done by 5:00.") Always specify what you're writing about.</li> <li>4. Don't use ALL CAPITALS (no shouting!), or all lower-case letters either (unless you're e. e. cummings).</li> <li>5. As a general rule, PLZ avoid textspeak (abbreviations and acronyms): <i>you</i> may be ROFLOL (rolling on the floor laughing out loud), but your reader may be left wondering WUWT (what's up with that).</li> <li>6. Be brief <i>and</i> polite. If your message runs longer than two or three short paragraphs, consider (a) reducing the message, or (b) providing an attachment. But in any case, don't snap, growl, or bark.</li> <li>7. Remember to say "please" and "thank you." And mean it. "Thank you for understanding</li> </ol>

- why afternoon breaks have been eliminated" is prissy and petty. It's *not* polite.
8. Add a signature block with appropriate contact information (in most cases, your name, business address, and phone number, along with a legal disclaimer if required by your company). Do you *need* to clutter the signature block with a clever quotation and artwork? Probably not.
  9. Edit and proofread before hitting "send." You may think you're too busy to sweat the small stuff, but unfortunately your reader may think you're a careless dolt.
  10. Finally, reply promptly to serious messages. If you need more than 24 hours to collect information or make a decision, send a brief response explaining the delay.

### **1. Start with a salutation**

Your email should open by addressing the person you're writing to. Sure, you can get away with leaving out the salutation when you're dashing off an email to your friend, but business-like messages should begin with:

- *Dear Mr Jones*, or *Dear Professor Smith*, (for someone you don't know well, especially if they're a superior)
- *Dear Joe*, or *Dear Mandy*, (if you have a working relationship with the person)

It's fine to use "Hi Joe", "Hello Joe" or just the name followed by a comma ("Joe,") if you know the person well – writing "Dear Joe" to one of your team-mates will look odd!

### **2. Write in short paragraphs**

Get straight to the point – don't waste time waffling. Split your email into two to four short paragraphs, each one dealing with a single idea. Consider using bullet-points for extra clarity, perhaps if you are:

- Listing several questions for the recipient to answer
- Suggesting a number of alternative options
- Explaining the steps that you'll be carrying out

Put a double line break, rather than an indent (tab), between paragraphs.

### **3. Stick to one topic**

If you need to write to someone about several different issues (for example, if you're giving your boss an update on Project X, asking him for a review meeting to discuss a payrise, and telling him that you've got a doctor's appointment on Friday), then don't put them all in the same email. It's hard for people to keep track of different email threads and conversations if topics are jumbled up.

### **4. Use capitals appropriately**

Emails should follow the same rules of punctuation as other writing. Capitals are often misused.

In particular, you should:

- Never write a whole sentence (or worse, a whole email) in capitals
- Always capitalise "I" and the first letter of proper nouns (names)
- Capitalise acronyms (*USA, BBC, RSPCA*)
- Always start sentences with a capital letter.

This makes your email easier to read: try retyping one of the emails you've received in ALL CAPS or all lower case, and see how much harder it is to follow!

### **5. Sign off the email**

For short internal company emails, you can get away with just putting a double space after your last paragraph then typing your name. If you're writing a more formal email, though, it's essential to close it appropriately.

- Use *Yours sincerely*, (when you know the name of your addressee) and *Yours faithfully*, (when you've addressed it to "Dear Sir/Madam") for very formal emails such as job

- applications.
- Use *Best regards*, or *Kind regards*, in most other situations.
  - Even when writing to people you know well, it's polite to sign off with something such as "All the best," "Take care," or "Have a nice day," before typing your name.

#### **6. Use a sensible email signature**

Hopefully this is common sense – but don't cram your email signature with quotes from your favourite TV show, motivational speaker or witty friend. Do include your name, email address, telephone number and postal address (where appropriate) – obviously, your company may have some guidelines on these.

It makes it easy for your correspondents to find your contact details: they don't need to root through for the first message you sent them, but can just look in the footer of any of your emails. Putting it all together

Compare the following two job applications. The content of the emails are identical – but who would you give the job to?

*i've attached my resume i would be grateful if you could read it and get back to me at your earliest convenience. i have all the experience you are looking for – i've worked in a customer-facing environment for three years, i am competent with ms office and i enjoy working as part of a team. thanks for your time*

Or

*Dear Sir/Madam,*

*I've attached my resume. I would be grateful if you could read it and get back to me at your earliest convenience. I have all the experience you are looking for:*

- *I've worked in a customer-facing environment for three years*
- *I am competent with MS office*
- *I enjoy working as part of a team*

*Thanks for your time.*

*Yours faithfully,*

*Joe Bloggs*

#### **E-Mail Writing16MBTL3**

1. Send an email to your friend sharing your experience about your College.
2. Send an email to your mother sharing your first weekend experience with your friends.
3. Imagine yourself to be the Team Leader in TCS and send a mail to your team appreciating successful completion of the Project.

#### **Scheme of Marks :**

**Format – 6M**

**Key Words – 4M**

**Presentation- 2M**

**Content - 4M**

#### **4. Letter of Job Application 16MBTL 4**

From

M. Raja,  
45, Ragav Apartments,

Rajaji Nagar,  
Chennai – 73

To

The Executive Director,  
Godrej Company Limited,  
455, Greams Road,  
Chennai – 600 035

Sir,

Sub: Application for the post of Production Manager – Reg.

Ref: With reference to the advertisement in “The Hindu” dated 18.02.2012

I am a Mechanical Engineering graduate. I have been working in “Prakash Furniture Ltd” as Production Manager for three years. I have managerial skills and inter-personal skills. I have enclosed my resume for your perusal.

Expecting your intimation letter

Thanking you,

Yours faithfully,

(M.Raja)

#### RESUME

M. Raja  
45, Ragav Apartments,  
Rajaji Nagar,  
Chennai – 73

Mobile: 9944488077  
E-mail: raja.m@gmail.com

#### OBJECTIVE

To pursue a challenging position in whatever I do and to contribute towards the growth of the organization.

#### EDUCATIONAL QUALIFICATION:

	B.E	-	Mechanical Engineering – 90% ABC Engineering College, Chennai – 13 May 2008
	HSC	-	Govt. Higher Secondary School - 85% Chennai – 73 May 2004
<b>EXPERIENCE:</b>			
	July 2009 – till date	-	Production Manager, Prakash Furniture Ltd, Trichy.
	July 2008 – July 2009 -		Junior Production Manager, Rahul Furniture Ltd., Rasipuram, Namakkal. (Dt)
<b>ACHIEVEMENTS:</b>			
		-	University gold medalist at UG Level.
		-	Won the best project award.
		-	Presented many papers in conferences and seminars.
<b>RESPONSIBILITIES:</b>			
		-	Sports secretary in 12 <sup>th</sup> std.
		-	Class representative from 10 <sup>th</sup> std.
		-	Captain of college football team.
<b>REFERENCES:</b>			
		1.	Dr. V. M. Periasamy, Principal, BSA Engineering College, Nagarkoil.
		2.	Mr. Ashok Kumar, The General Manager, Prakash Furniture Ltd., Trichy.
<b>PERSONAL PROFILE:</b>			
Name		:	M. Raja
Date of Birth		:	12.08.1987
Age		:	29
Gender		:	Male
Father's Name		:	R. Manikkavasagam
Nationality		:	Indian

Religion	: Hindu
Languages Known	: Tamil, English.

**DECLARATION**

I hereby solemnly declare that all the information made is true to the best of my knowledge and belief.

Thank you,

Yours faithfully,

**Place:** Chennai

**Date:** 20.02.12

(M. Raja)

1 .Write a letter of application for the post of an Assistant Engineer to The Human Resource Manager, HRC Communication Ltd., 390, Lake View Road, Santhome, Chennai – 600 004. Attach a separate resume with your letter. **(AU, May/June 2014)**

2. Write a letter of application for the post of Team Leader to The Human Resource Manager, Mayday Motors Ltd., 327, G.T. Naidu Road, Coimbatore. Write the details of your qualification and experience within the application letter. **(AU, May/June 2014)**

3. Write a letter of application for the post of a Junior Engineer to the Divisional Engineer, Mambalam Division, Chennai Telephones, 786, Anna Salai, Chennai – 35. Attach a suitable bio-data with the application.

4. The Chief Engineer of Public Works Department, Kancheepuram, wants to make you a member of the technical committee on Road Developments in Kancheepuram. Write a letter of thanks to him and also enclose your resume with your letter. **(AU, May/June 2013)**

5. Draft a letter of Job Application in response to the following advertisement. Candidates holding a bachelor's / master's degree with a background in engineering are required for work on company for the post of engineer. Applicants' must also possess excellent writing skills and the ability to effectively and CV to Mr.PromodTiwari, Human Resources Dept., Exclusive software, North Main Street, Chennai – 67. **(AU, May/June2012)**

6. You have come across the following advertisement in the newspaper on 12<sup>th</sup> June 2014. Write a letter of application and detailed CV to one of the posts selected:

A leading private sector company in India needs the following engineers for the various projects in India **(AU, May/June2015)**

	<p>1. CIVIL/MECHANICAL ENGINEERS      2. ELECTRICAL / MANUFACTURING ENGINEERS      3. CHEMICAL ENGINEERS      4. COMPUTER SCIENCE ENGINEERS</p> <ul style="list-style-type: none"> <li># 1 to 3 years of experience</li> <li># Should be able to work in a team</li> <li># Good communication skills</li> </ul> <p>Apply to      The Managing Director,      L and T Ltd.,      Bangalore – 5      Email ID : landtl4@gmail.com</p>	
--	---	--

7. You come across the following advertisement

(AU, May/June2015)

<p>Company Name : Way Staffing      Location : Thane, Pune      Nationality : India      Salary : 6.50 – 8.50 lacs      Experience : 3 – 8 yrs      Education : B.E. / B.Tech</p> <ul style="list-style-type: none"> <li>• IT</li> <li>• Manufacturing/ Engineering / R&amp;D</li> </ul> <p>Posted on : 30<sup>th</sup> August 2018</p>	<p>Role : Technical Support      Engineer : Civil Engineer      Electrical Engineer      Industry : Engineering,      Procurement      Construction</p>
---	---

8. Prepare a detailed CV to be uploaded in the website.

8. Read the following advertisement published in “The Times of India” and write a letter of application. Enclose your resume with the letter of application. (AU, Nov/Dec, 2014)

<p>Job : Software Engineer      Company : Kamal Info Systems Private Limited      Location: Hyderabad      Eligibility : B.E. / B.Tech      Skills: Capital Markets, Object Oriented Project Planning, Design Patterns in Java, C++      Send your application with the resume to: The HR Manager, Kamal Info Systems Private Limited, No.14, Greams Road, Hyderabad –</p>
--

	500 002.	
	<b>Scheme of Marks :</b> <b>Format</b> – 6M <b>Presentation-</b> 4M <b>Content</b> - 6M	
	<b>UNIT V</b> <b>GROUP DISCUSSION AND JOB APPLICATIONS</b>	<b>12</b>
	<b>Listening-</b> TED/Ink talks; <b>Speaking</b> –participating in a group discussion - <b>Reading</b> – reading and understanding technical articles <b>Writing</b> – Writing reports- minutes of a meeting- accident and survey <b>Vocabulary Development-</b> verbal analogies <b>Language Development-</b> reported speech	
1	<p style="text-align: center;"><b>PART* A</b></p> <p><b>Reported Speech</b> 2M BTL 3</p> <ol style="list-style-type: none"> <li>1. “I will work hard to get first class” said Lazar (D.S.) Lazar said he would work hard to get first class. (I.S.)</li> <li>2. “You can do this work” said Nelson to Johnsi (D.S.) Nelson told Johnsi that he could do that work. (I.S.)</li> <li>3. He says, “I am glad to be here this evening”(D.S.) He says that he is glad to be there that evening. (I.S.)</li> <li>4. “I’m going to the library now” said David (D.S.) David said that he was going to the library then. (I.S.)</li> <li>5. “Don’t talk in the class” said the teacher to the boys. (D.S.) The teacher advised the boys not to talk in the class. (I.S.)</li> <li>6. “Please give me something to eat. I am hungry” the old man said to them. (D.S.) The old man requested them to give him something to eat and said that he was hungry (I.S.)</li> <li>7. Mohan said to Stalin, “Why did you not attend the meeting yesterday”? (D.S.) Mohan asked Stalin why he had not attended the meeting the day before. (I.S.)</li> <li>8. “How often do you go to the theatre?” said David to John. (D.S.) David asked John how often he went to the theatre. (I.S.)</li> </ol>	

9. Alas! I have broken my brother's watch" said he.  
He exclaimed sorrowfully that he had broken his brother's watch. (I.S.)
10. "How beautiful the flower is!" said Kumar. (D.S.)  
Kumar exclaimed joyfully that the flower was very beautiful. (I.S.)
11. "Won't you help me to carry this box?" said I to my friend. (D.S.)  
I asked my friend if he would not help me to carry that box. (I.S.)
12. Mohan said to Stalin, "Why did not you attend the meeting yesterday"? (D.S.)  
Mohan asked Stalin why he had not attended the meeting the day before. (I.S.)
13. "How often do you go to the theatre?" said David to John. (D.S.)  
David asked John how often he went to the theatre. (I.S.)
14. Mohamed said to Sultan, "Do you like mangoes?" (D.S.)  
Mohamed asked Sultan if he liked mangoes. (I.S.)
- 15. The teacher has said to the pupils, "Sea-water is different from the river water."**  
The teacher has told the pupils that sea-water is different from river water.
- 16. David answered, "The Mines are under the ground".**  
David answered that the Mines are under the ground.
- 17. John said to his brother, "The U.N.O. is a world organization".**  
John told his brother that the U.N.O. is a world organisation.
- 18. The Science teacher told the class, "Ice floats on water.".**  
The Science teacher told the class that ice floats on water.
- 19. "I don't know the way. Do you?" he asked.**  
He said that he didn't know the way and asked her if she did.
- 20. She said, "Oh! It's a snake. Don't go near it, children."**  
She exclaimed with disgust that it was a snake and told the children not to go near it.
- 21. "If the floods get any worse we must leave the house", he said.**  
(must = will have to)  
He said that if the floods got any worse they would have to leave the house.
- 22. "I have just received a letter", he said; "I must go home at once".**  
He said that he had just received a letter and would have to go home at once.

	<p><b>23.</b> Angel said, "I brought a pen yesterday". (D.S) Angel said that she had bought a pen the day before. (I.S)</p> <p><b>24. John said, "I am going to church". (D.S)</b> John said that he was going to church. (I.S)</p> <p><b>25. He said, "I have been reading a novel". (D.S)</b> He said that he had been reading a novel. (I.S)</p>
2	<p><b>Verbal Analogies: 2M BTL3</b></p> <p><b>1.</b> Sing : hum :: Talk : _____ a. murmur b. whisper c. <b>mumble</b> d. shout</p> <p><b>2.</b> Liquid : liter a. Weight : kilogram b. Land : seismometer c. Bushel : corn d. Fame : television</p> <p><b>3.</b> If Dawn: Morning, then Dusk: _____ a. Evening : b. Night : c. Darkness :d. Fog</p> <p><b>4.</b> If Parson lives in Parsonage, then Pioneer lives in _____ a. Cottage : b. <b>Wagon</b> : c. Monastery : d. Barracks</p> <p><b>5.</b> If Ravens: Croak, then Ducks: _____ a. Talk :b. Gobble : c. Squeak : d. <b>Quack</b></p> <p><b>6.</b> If Bears: Growl, then Asses: _____ a. Growl :b. <b>Bray</b> : c. Purr : d. Bleat</p> <p><b>7.</b> _____ : trail:: grain : grail a. train : b. path : c. wheat : d. holy</p> <p><b>8.</b> particular : fussy :: _____ : subservient a. meek : b. above : c. cranky : d. uptight</p> <p><b>9.</b> _____ : horse :: board : train a. stable : b. shoe : c. ride : d. mount</p> <p><b>10.</b> tureen : _____ ::goblet : wine a. napkin : b. soup : c. spoon : d. pilsner</p> <p><b>11.</b> son : nuclear :: _____ : extended a. father : b. mother : c. cousin : d. daughters</p> <p><b>12.</b> coif : hair :: _____ : musical a. Shower : b. close : c. praise : d. score</p> <p><b>13.</b> feta : Greek :: provolone : _____ a. salad : b. Swiss : c. blue : d. Italian</p> <p><b>14.</b> moccasin : snake :: _____ : shoe a. alligator : b. <b>waders</b> : c. asp : d. loafer</p> <p><b>15.</b> _____ : zenith :: fear : composure a. apex : b. <b>heaven</b> : c. heights : d. nadir</p> <p><b>16.</b> pill : bore :: core : _____</p>

	<p>a. <b>center</b> : b. mug : c. bar : d. placebo</p> <p><b>17. pilfer</b> : steal :: _____ : <b>equip</b></p> <p>a. return : b. damage : c. exercise : d. furnish</p> <p><b>18. native</b> : <b>aboriginal</b> :: <b>naïve</b> : _____</p> <p>a. learned : b. <b>arid</b> : c. unsophisticated : d. tribe</p> <p><b>19. junket</b> : _____ :: <b>junk</b> : <b>trash</b></p> <p>a. trounce : b. trip : c. refuse : d. trinket</p> <p><b>20. _____</b> : <b>festive</b> :: <b>funeral</b> : <b>somber</b></p> <p>a. tension : b. soiree : c. eulogy : d. <b>sari</b></p> <p><b>21. fetish</b> : <b>fixation</b> :: <b>slight</b> : _____</p> <p>a. flirt : b. sloth : c. insult : d. confuse</p> <p><b>22. hovel</b> : <b>dirty</b> :: <b>hub</b> : _____</p> <p>a. unseen : b. prideful : c. <b>busy</b> : d. shove</p> <p><b>23. bog</b> : _____ :: <b>slumber</b> : <b>sleep</b></p> <p>a. dream : b. <b>foray</b> : c. marsh : d. night</p> <p><b>24. _____</b> : <b>segue</b> :: <b>throng</b> : <b>mass</b></p> <p>a. <b>subway</b> : b. church : c. transition : d. line</p>
	<b>PART * B</b>
3.	<p><b>Minutes of a Meeting 16M BTL 3</b></p> <ol style="list-style-type: none"> <li>1. Write the minutes of the meeting of organizing a cultural event in the college. Discuss about the budget, responsibilities for organizing functions, Programme, guests and honor, food, stage decoration, logistics, food, publicity. As the secretary, write the minutes of meeting.</li> <li>2. Write Minutes of meeting for the class committee meeting held on 19<sup>th</sup> January 2019.</li> <li>3. Write Minutes of meeting for the research meeting over the project with the panel members held on 20<sup>th</sup> January 2019.</li> <li>4. Write Minutes of meeting for the celebration of College day on 24<sup>th</sup> of march 2018.</li> <li>5. Write Minutes of meeting for the meeting between the officer in the Environment Pollution Authority and the Transport Department authority regarding air pollution.</li> </ol> <p><b>Scheme of Marks :</b>  <b>Format</b> – 6M  <b>Presentation-</b> 4M  <b>Content</b> - 6M</p>
4.	<p><b>Report Writing 16M BTL 4</b></p> <ol style="list-style-type: none"> <li>1. You are working as a Technical Manager in a Software Company, Hidalco Inc. There was a fire accident in your warehouse which resulted in the damage of goods stored there. Your MD asks you to investigate the cause of the accident and send a report. (2018 )</li> <li>2. Your college administration wants to find what students feel about your college's environment and facilities. As student advisor you have been asked to conduct a survey among students about college infrastructure and environment. Conduct a survey on these topics and submit a report to your Dean.(2018 )</li> </ol>

3. A company is planning to set up a small shoe unit in a small village 20km from Ranipet. You are asked to prepare a suitable report about the feasibility of starting the factory. Mention the availability of raw materials and labour in your area.
4. Write a survey report on the reading habits of engineering students for submission to your college principal. Also give a set of recommendations for enhancing the reading habits of technical students.
5. You are the Works Manager in Industrial Gases Limited where LPG Cylinders are filled for utilization by the consumers. Write a report about an accident that happened in the LPG section in which three workers were seriously injured.

**Scheme of Marks :****Format – 6M****Presentation- 4M****Content - 6M**

formal report may include the following points

1. Title Page
2. Executive Summary
3. Abstract
4. Objective
5. Technical details
6. Cost estimation
7. Management Plan
8. Conclusion
9. Recommendations

**Title Page**

Imagine that you are going to start a language lab in your Institution. Write a detailed proposal about the need for establishing the lab to the General Manager.

**A PROPOSAL TO ESTABLISH THE LANGUAGE LAB**

SUBMITTED TO  
 Mr. R. Ravichandran  
 The General Manager  
 ABC Group of Institutions  
 Chennai-28

SUBMITTED BY  
 Mr. G. Sathiaraj  
 Department of English

ABC Engineering College  
Chennai- 28

DATE  
10th April 2013

**A. Executive Summary**

1. Project Title : Establishing Computer Assisted Language Lab
2. Name & Designation of the Department : Mr. G. Sathiaraj., Asst. Prof  
Department of English  
ABC Engineering College  
Chennai- 28
3. Duration of the Project : 3 Months
4. Amount Required : 20 lakhs

**B. Abstract**

Communication skills become inevitable in today's survival. Communication skill is expected by every IT firms. Everyone must have a good proficiency in English Language.

To meet these expectations, it is proposed to establish a computer assisted language lab in our institution. So, the student could have been provided an independent learning opportunity and acquire the language proficiency.

**C. Objective**

To establish Computer Assisted language lab to improve and impart the language proficiency of the learning community.

**D. Technical plan**

It is planned to install 60 students systems with one Teacher control server. 15 different softwares for practice.

**E. Cost Estimation**

Product	Cost per Unit	Required Unit	Total Cost	Remarks
P-IV computer with 360 GB HD	35000	1	35000	
P-IV computer with 180 GB HD	30000	60	1800000	
Head Phones with Mike	500	61	30500	
Language Learning Softwares	15	1 each	300000	
Split A/C 1.5 ton	25000	2	50000	
			Total	1946000

**F. Management Plan**

1. The lab may be taken care by Department of English

	<p>2. Lab hours may be included in the Regular Time Table 3. One Technical Assistant may be appointed to assist. 4. One staff may be given in-charge. G. Recommendations So, It is recommended to establish a Computer Assisted Language Lab at our institution.</p>

JIT-2106

## SYLLABUS

**MA8251                    ENGINEERING MATHEMATICS-II      L T P C**

**3 1 0 4**

### **OBJECTIVES:**

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

### **UNIT I    MATRICES**

**9+3**

Eigenvalues and Eigenvectors of a real matrix - Characteristic equation - Properties of eigenvalues and eigenvectors - Statement and applications of Cayley-Hamilton Theorem - Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation –Nature of quadratic forms.

### **UNIT II VECTOR CALCULUS**

**9+3**

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem(excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

### **UNIT III ANALYTIC FUNCTIONS**

**9+3**

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping:  $w = z+k$ ,  $kz$ ,  $1/z$ ,  $z^2$ ,  $e^z$  and bilinear transformation.

### **UNIT IV COMPLEX INTEGRATION**

**9+3**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

### **UNIT V LAPLACE TRANSFORM**

**9+3**

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform -Statement of

Convolution theorem – Initial and final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, Eighth Edition, Laxmi Publications Pvt Ltd.,(2011).
2. Grewal. B.S, “Higher Engineering Mathematics”, 41 st Edition, Khanna Publications, Delhi, (2011).

**REFERENCES:**

1. Dass, H.K., and Er. RajnishVerma,” Higher Engineering Mathematics”, S. Chand Private Ltd., (2011)
2. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, (2012).
3. Peter V. O’Neil,” Advanced Engineering Mathematics”, 7th Edition, Cengage learning, (2012).
4. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2008).

**Subject Code:** MA8251

**Year/Semester:** I /II

**Subject Name:** ENGINEERING MATHEMATICS-II

**Subject Handler:** Dr.M.RANJITH KUMAR

	<b>UNIT-I MATRICES</b>
	Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.
<b>Q.No.</b>	<b>PART-A</b>
1	<b>State Cayley Hamilton theorem and give its two uses.</b> <b>(NOV/DEC 2015)(MAY/JUNE 2012)BTL1</b> Every square matrix satisfies its own characteristic equation. It is used to calculate <ul style="list-style-type: none"><li>i. The positive integral powers</li><li>ii. The inverse of a square matrix.</li></ul>

2	<p>If <math>\lambda_1, \lambda_2, \dots, \lambda_n</math> are Eigen values of a matrix A then show that <math>\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, \dots, \frac{1}{\lambda_n}</math> are Eigen values of <math>A^{-1}</math>.BTL2</p> <p>If <math>\lambda_i</math> and <math>X_i</math> are corresponding Eigen value and Eigen vector of A where <math>i=1,2,\dots,n</math>.</p> $\begin{aligned} AX_i &= X_i A^{-1}(AX_i) = A^{-1}(\lambda_i X_i) \\ \Rightarrow IX_i &= \lambda_i A^{-1}X_i \\ \Rightarrow X_i &= \lambda_i A^{-1}X_i \\ \Rightarrow A^{-1}X_i &= 1/\lambda_i X_i \\ \Rightarrow A^{-1} &= 1/\lambda_i \end{aligned}$ <p><math>\therefore 1/\lambda_i</math> is an Eigen values of <math>A^{-1}</math></p>
3	<p>If <math>\lambda_1, \lambda_2, \dots, \lambda_n</math> are Eigen values of an <math>n \times n</math> matrix A then show that <math>\lambda_1^3, \lambda_2^3, \dots, \lambda_n^3</math> are Eigen values of <math>A^3</math>.BTL2</p> <p>Let <math>\lambda</math> be Eigen value of A and let X be Eigen vector of A.</p> $\begin{aligned} \therefore AX &= \lambda X \\ A^2X &= A\lambda X = \lambda(AX) = \lambda(\lambda X) = \lambda^2 X \\ \therefore A^2 &= \lambda \end{aligned}$ <p>Similarly, <math>A^3X = \lambda^3X \Rightarrow A^3 = \lambda^3</math></p> <p><math>\therefore \lambda^3</math> is an Eigen value of <math>A^3</math>.</p>
4	<p>If <math>\lambda</math> is the eigenvalue of the matrix A, then prove that <math>\lambda^2</math> is the eigenvalue of <math>A^2</math>. (APR/MAY 2019)</p> <p>Let <math>\lambda</math> be Eigen value of A and let X be Eigen vector of A.</p> $\begin{aligned} \therefore AX &= \lambda X \\ A^2X &= A\lambda X = \lambda(AX) = \lambda(\lambda X) = \lambda^2 X \\ \therefore A^2 &= \lambda \end{aligned}$
5	<p>Two Eigen values of <math>A = \begin{pmatrix} 2 &amp; 2 &amp; 1 \\ 1 &amp; 3 &amp; 1 \\ 1 &amp; 2 &amp; 2 \end{pmatrix}</math> are equal and are <math>\frac{1}{5}</math> times to the third. Find them. (NOV/DEC 2014) BTL1</p> <p>Let <math>\lambda_1, \lambda_2, \lambda_3</math> be Eigen values of A.</p> <p>Given <math>\lambda_1 = \lambda_2 = \frac{1}{5}\lambda_3</math></p> <p>We know sum of Eigen values = sum of diagonal elements</p> $\begin{aligned} \lambda_1 + \lambda_2 + \lambda_3 &= 7 \\ \frac{1}{5}\lambda_3 + \frac{1}{5}\lambda_3 + \lambda_3 &= 7 \\ \frac{7}{5}\lambda_3 &= 7 \\ \therefore \lambda_3 &= 5 \\ \therefore \lambda_1 = \lambda_2 &= 1. \end{aligned}$

5	<p><b>Find the Eigen values of <math>A^2</math> given <math>A = \begin{pmatrix} 1 &amp; 2 &amp; 3 \\ 0 &amp; 2 &amp; -7 \\ 0 &amp; 0 &amp; 3 \end{pmatrix}</math>. Also find <math>A^3, A^{-1}, 2A^2</math>. BTL1</b></p> <p>We know the Eigen values of a triangular matrix are just the diagonal elements.      Here given matrix is a upper triangular matrix  <math>\therefore</math> Eigen values of <math>A</math> are 1,2,3.</p> <p>We know that</p> <p>"if <math>\lambda_1, \lambda_2, \dots, \lambda_n</math> are Eigen values of a matrix <math>A</math>, then <math>\lambda_1^m, \lambda_2^m, \dots, \lambda_n^m</math> are Eigen values of <math>A^m</math>."  <math>\therefore</math> Eigen values of <math>A^2</math> are 1,4,9.  <math>\therefore</math> Eigen values of <math>A^3</math> are 1,8,27. We know that if <math>\lambda_1, \lambda_2, \dots, \lambda_n</math> are Eigen values of <math>A</math>  then <math>k\lambda_1, k\lambda_2, \dots, k\lambda_n</math> are Eigen values of <math>KA</math>  <math>\therefore</math> Eigen values of <math>2A^2</math> are 2,8,18</p>
6	<p><b>If <math>A</math> is an orthogonal matrix Show that <math>A^{-1}</math> is also orthogonal.</b> BTL2</p> <p>Let <math>A</math> be orthogonal matrix  i.e. <math>A^T = A^{-1}</math>  Let <math>A^T = A^{-1} = B</math>  <math>B^T = (A^{-1})^T = (A^T)^{-1} = B^{-1}</math>  Therefore <math>B</math> is orthogonal.  i.e. <math>A^{-1}</math> is an orthogonal matrix.</p>
7	<p><b>Prove that the product of 2 orthogonal matrices is an orthogonal matrix.</b> BTL5</p> <p>Let <math>A</math> be an <math>n^{\text{th}}</math> order orthogonal matrix.  <math>\therefore AA' = A'A = I</math>  Let <math>B</math> be an <math>n^{\text{th}}</math> order orthogonal matrix.  <math>BB' = B'B = I</math>  Now <math>(AB)'(AB) = AB B'A'</math>  <math>= AIA'</math>  <math>= AA'</math>  <math>= I</math>  Now <math>(AB)'(AB) = B'A'AB</math>  <math>= B'IB</math>  <math>= B'B</math>  <math>= I</math>  Since <math>(AB)'(AB) = (AB)'(AB) = I</math>.  <math>AB</math> is orthogonal matrix.</p>
8	<p><b>If 1 and 2 are Eigen values of a <math>2 \times 2</math> matrix <math>A</math>, what are the Eigen values of <math>A^2</math> and <math>A^{-1}</math>.</b> BTL1</p> <p>Eigen values of <math>A^2</math> are 1 and 4</p>

	Eigen values of $A^{-1}$ are 1 and $\frac{1}{2}$ .
9	If 2, 3 are the Eigen value of $A = \begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ b & 0 & 2 \end{pmatrix}$ then find the value of b?  (NOV/DEC 2013)BTL1  Given Eigen values are $\lambda_1 = 2, \lambda_3 = 3$ Sum of the Eigen values = Sum of the main diagonal elements $\lambda_1 + \lambda_2 + \lambda_3 = 6$ $2 + 3 + \lambda_3 = 6$ $5 + \lambda_3 = 6$ $\lambda_3 = 1$ Product of the Eigen value = $ A $ $(2)(3)(1) = 8 - 2b$ $6 = 8 - 2b$ $b = 1$
10	If the sum of two Eigen values and trace of a $3 \times 3$ matrix A are equal, find the value of $ A $ .BTL1  Let $\lambda_1, \lambda_2, \lambda_3$ be the Eigen values of A. Then we have $\lambda_1 + \lambda_2 = \text{trace of } A$ $\Rightarrow \lambda_1 + \lambda_2 = \lambda_1 + \lambda_2 + \lambda_3 \Rightarrow \lambda_3 = 0$ . Hence $ A  = \text{product of Eigen values} = \lambda_1 \lambda_2 \lambda_3 = 0$
11	For a given matrix A of order 3, $ A  = 32$ and two of its Eigen values are 8 and 2. Find the sum of the Eigen values.  BTL1  Given Eigen value be $\lambda_1 = 8, \lambda_2 = 2$ .  Then $(8)(2)(\lambda_3) =  A  = 32 \Rightarrow \lambda_3 = 2$  Let the third Eigen value be $\lambda_3 = 2$  Hence the sum of the Eigen values = $\lambda_1 + \lambda_2 + \lambda_3 = 8 + 2 + 2 = 12$
12	Find the sum and product of the Eigen values of the square matrix $A = \begin{pmatrix} 8 & 1 & 6 \\ 3 & 5 & 7 \\ 4 & 9 & 2 \end{pmatrix}$ .  (NOV/DEC 2010)BTL1 Sum of the Eigen values = sum of the main diagonal elements = $8+5+2=15$ Product of the Eigen values = $ A  = 8(10-63)-1(6-28)+6(27-20)=-360$
13	Find the sum of the Eigen values of $2A$ if $A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$ .  BTL1

	<p>If <math>\lambda_1, \lambda_2, \lambda_3</math> are the Eigen values of A, then <math>\lambda_1 + \lambda_2 + \lambda_3 = 18</math>.</p> <p>We know that <math>2\lambda_1, 2\lambda_2, 2\lambda_3</math> are the Eigen values of <math>2A</math>.</p> <p>Therefore the sum of Eigen values of <math>2A = 2(\lambda_1 + \lambda_2 + \lambda_3) = 2(18) = 36</math></p>
	<p><b>If the Eigen value of A are 3x3 are 2,3 and 1, then find the Eigen values of adjA.</b> <b>(NOV/DEC 2003)BTL1</b></p> <p>The Eigen values of are 2,3,1</p> <p>The Eigen value of <math>A^{-1}</math> are <math>\frac{1}{2}, \frac{1}{3}, 1</math></p> <p>The product of Eigen values are <math>(2)(3)(1) =  A </math></p> $\therefore  A  = 6$
14	<p>We know that <math>A^{-1} = \frac{1}{ A } adjA</math></p> $adjA =  A  A^{-1}$ <p>The Eigen value of adjA are</p> $(6)\left(\frac{1}{2}\right), (6)\left(\frac{1}{3}\right), (6)1$ $\Rightarrow 3, 2, 6$
	<p><b>If the eigenvalue of the matrix A of the order 3x3 are 2, 3 and 1, then find the determinant of A. (APR/ MAY 2019)</b></p> <p>The Eigen values of are 2,3,1</p> <p>The product of Eigen values are <math>(2)(3)(1) =  A </math></p> $\therefore  A  = 6.$
15	<p><b>Find the sum of the squares of the Eigen values of <math>A = \begin{pmatrix} 3 &amp; 1 &amp; 4 \\ 0 &amp; 2 &amp; 6 \\ 0 &amp; 0 &amp; 5 \end{pmatrix}</math>.</b></p> <p><b>(NOV/DEC 2016)BTL1</b></p> <p>A is a triangular matrix. Therefore the Eigen values of A are 3, 2 and 5.</p> <p>The sum of squares of the Eigen values of <math>A^2 = 3^2 + 2^2 + 5^2 = 9 + 4 + 25 = 38</math></p>
16	<p><b>Find the Eigen values of <math>2A - I</math>, given <math>A = \begin{pmatrix} -4 &amp; 1 \\ 3 &amp; -2 \end{pmatrix}</math>.</b></p> <p style="text-align: right;"><b>BTL1</b></p>

$$2A - I = \begin{pmatrix} -8 & 2 \\ 6 & -4 \end{pmatrix} - \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} -9 & 2 \\ 6 & -5 \end{pmatrix}$$

The Characteristic equation of  $2A - I$  is given by

$$|2A - I - \lambda I| = 0 \Rightarrow \begin{vmatrix} -9 - \lambda & 2 \\ 6 & -5 - \lambda \end{vmatrix} = 0$$

$$\Rightarrow \lambda^2 + 14\lambda + 33 = (\lambda + 11)(\lambda + 3) = 0$$

$$\Rightarrow \lambda = -3, -11$$

**Prove that  $A$  and  $A^T$  have the same Eigen values.**

BTL5

$$|A^T - \lambda I| = |A^T - (\lambda I)^T| = |(A - \lambda I)^T| = |A - \lambda I|$$

$\Rightarrow A$  and  $A^T$  have the same characteristic equation and hence they have the same Eigen values.

**Prove that Similar matrices have the same characteristic roots.**

BTL5

Let  $A$  and  $B$  be two similar matrices, then there exists a matrix  $P$  such that  $B = P^{-1}AP$ .

$$\text{Hence } |B - \lambda I| = |P^{-1}AP - P^{-1}\lambda IP| = |P^{-1}(A - \lambda I)P| = |A - \lambda I||PP^{-1}| = |A - \lambda I|$$

i.e.,  $A$  and  $B$  have the same characteristic equation. Therefore, they have the same Characteristic roots.

**Is the matrix  $B = \begin{pmatrix} \cos \theta & \sin \theta & 0 \\ -\sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$  orthogonal? Justify.** BTL5

$$BB^T = \begin{bmatrix} \cos \theta & \sin \theta & 0 \\ -\sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I$$

Similarly,  $B^T B = I$ . Hence  $B$  is orthogonal.

**Use Cayley-Hamilton theorem to find  $A^4 - 4A^3 - 5A^2 + A + 2I$  where  $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ .** BTL3

$$|A - \lambda I| = 0 \Rightarrow \begin{vmatrix} 1 - \lambda & 2 \\ 4 & 3 - \lambda \end{vmatrix} = 0 \Rightarrow \lambda^2 - 4\lambda - 5 = 0 \Rightarrow A^2 - 4A - 5I = 0$$

(By Cayley-Hamilton Theorem)

$$\Rightarrow A^2(A^2 - 4A - 5I) = 0 \Rightarrow A^4 - 4A^3 - 5A^2 = 0$$

$$\Rightarrow A^4 - 4A^3 - 5A^2 + A + 2I = 0 + A + 2I = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix} + \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}.$$

**Can  $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$  be diagonalised? Why?** (MAY/JUNE 2016) BTL1

Yes. Even if the Eigen values of  $A$  are equal, namely 1, 1, it is possible to find two linearly

	independent Eigen vectors corresponding to the Eigen value 1.
22	<p><b>Find the matrix of the quadratic from</b> <math>2x^2 + 2y^2 + 3z^2 + 2xy - 4xz - 4yz</math>. <span style="float: right;">BTL1</span></p> <p>The required matrix <math>A = \begin{bmatrix} \text{coeff } x^2 &amp; \frac{1}{2}\text{coeff } xy &amp; \frac{1}{2}\text{coeff } xz \\ \frac{1}{2}\text{coeff } yx &amp; \text{coeff } y^2 &amp; \frac{1}{2}\text{coeff } yz \\ \frac{1}{2}\text{coeff } zx &amp; \frac{1}{2}\text{coeff } zy &amp; \text{coeff } z^2 \end{bmatrix}</math></p> $A = \begin{pmatrix} 2 & 1 & -2 \\ 1 & 2 & -2 \\ -2 & -2 & 3 \end{pmatrix}$
23	<p><b>Find the nature of the quadratic form</b> <math>x_1^2 + 2x_2^2 + x_3^2 - 2x_1x_2 + 2x_2x_3</math>. <span style="float: right;">(MAY/JUNE 2010) BTL1</span></p> <p><math>A = \begin{bmatrix} \text{coeff } x_1^2 &amp; \frac{1}{2}\text{coeff } x_1x_2 &amp; \frac{1}{2}\text{coeff } x_1x_3 \\ \frac{1}{2}\text{coeff } x_2x_1 &amp; \text{coeff } x_2^2 &amp; \frac{1}{2}\text{coeff } x_2x_3 \\ \frac{1}{2}\text{coeff } x_3x_1 &amp; \frac{1}{2}\text{coeff } x_3x_2 &amp; \text{coeff } x_3^2 \end{bmatrix}</math></p> $D_1 = \begin{vmatrix} 1 & -1 & 0 \\ -1 & 2 & 1 \\ 0 & 1 & 1 \end{vmatrix} =  a_{11}  = 1$ $D_2 = \begin{vmatrix} 1 & -1 & 0 \\ -1 & 2 & 1 \\ 0 & 1 & 1 \end{vmatrix} = \begin{vmatrix} 1 & -1 \\ -1 & 2 \end{vmatrix} = 2 - 1 = 1$ $D_3 =  A  = 1$ <p>The nature positive definite since all are positive values.</p>
24	<p><b>Write down the matrix corresponding to the quadratic form</b> <math>x^2 + y^2 + z^2 + 2zx + 4\sqrt{2}yz</math> <span style="float: right;">BTL1</span></p> <p>The required matrix <math>A = \begin{bmatrix} \text{coeff } x^2 &amp; \frac{1}{2}\text{coeff } xy &amp; \frac{1}{2}\text{coeff } xz \\ \frac{1}{2}\text{coeff } yx &amp; \text{coeff } y^2 &amp; \frac{1}{2}\text{coeff } yz \\ \frac{1}{2}\text{coeff } zx &amp; \frac{1}{2}\text{coeff } zy &amp; \text{coeff } z^2 \end{bmatrix}</math></p>



	$(2) \Rightarrow ab = -2$ $a(1-a) = -2$ $a^2 - a - 2 = 0$ $(a-2)(a+1) = 0 \quad \therefore a = 2 \text{ & } a = -1$ <p>when <math>a = 2</math> then <math>b = -1</math>  when <math>a = -1</math> then <math>b = 2</math>  <math>\therefore a = 2, b = -1</math> or <math>a = -1, b = 2</math></p>
28	<b>Find the Eigen values of <math>3A+2I</math>, where <math>A = \begin{pmatrix} 5 &amp; 4 \\ 0 &amp; 3 \end{pmatrix}</math>.</b> (MAY/JUNE 2007) BTL1 The Eigen values of $A$ are 5 and 2, The Eigen values of $3A+2I$ are $3(5)+2$ and $3(2)+2$ The Eigen values of $3A+2I$ are 17 and 8
29	<b>If 3 and 5 are two Eigen values of the matrix <math>A = \begin{pmatrix} 8 &amp; -6 &amp; 2 \\ -6 &amp; 7 &amp; -4 \\ 2 &amp; -4 &amp; 3 \end{pmatrix}</math> then find its third Eigen value and hence <math> A </math>.</b> (MAY/JUNE 2018 R-17) BTL1 Given Eigen value be $\lambda_1 = 3, \lambda_2 = 5$ . Sum of the Eigen values = Trace of $A$ $\lambda_1 + \lambda_2 + \lambda_3 = 8 + 7 + 3 = 18$ $\therefore \lambda_3 = 18 - 8 = 10$ Product of the Eigen value $ A  = 150$
30	<b>Show that Eigen values of a null matrix are zero</b> (MAY/JUNE 2018 R-17) BTL1 Let $A = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$ The Characteristic Equation is $\lambda^3 = 0$ $\therefore \lambda_1 = 0, \lambda_2 = 0, \lambda_3 = 0$
	<b>PART-B</b>
1.	<b>Find the Eigen values and Eigen vectors of <math>\begin{pmatrix} 2 &amp; 2 &amp; 0 \\ 2 &amp; 1 &amp; 1 \\ -7 &amp; 2 &amp; -3 \end{pmatrix}</math>.</b> (8M) BTL1 <b>Answer : Refer Page No.1.8-Dr.M.CHANDRASEKAR</b> <ul style="list-style-type: none"> <li>• The Eigen values are <math>\lambda = -4, 1, 3</math>. <span style="float: right;">(2 M)</span></li> </ul>

	<ul style="list-style-type: none"> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ -3 \\ 13 \end{bmatrix}; X_2 = \begin{bmatrix} 2 \\ -1 \\ -4 \end{bmatrix}; X_3 = \begin{bmatrix} 2 \\ 1 \\ 4 \end{bmatrix}</math> (6M)</li> </ul>
	<p><b>Find the Eigen values and Eigen vectors of</b> <math>\begin{pmatrix} 11 &amp; -4 &amp; -7 \\ 7 &amp; -2 &amp; -5 \\ 10 &amp; -4 &amp; -6 \end{pmatrix}</math> (May/June-2018 R-17) (8M)</p> <p>BTL1 Answer : Refer Page No.1.21-Dr.M.CHANDRASEKAR</p>
2.	<ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 0, 1, 2</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}; X_2 = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}; X_3 = \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}</math> (6M)</li> </ul>
3.	<p><b>Find the Eigen values and Eigen vectors of</b> <math>\begin{pmatrix} 1 &amp; 0 &amp; -1 \\ 1 &amp; 2 &amp; 1 \\ 2 &amp; 2 &amp; 3 \end{pmatrix}</math> (DEC/JAN-2016 R-13) (8M)</p> <p>BTL1 Answer : Refer Page No.1.10-Dr.M.CHANDRASEKAR</p> <ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 1, 2, 3</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}; X_2 = \begin{bmatrix} 2 \\ -1 \\ -2 \end{bmatrix}; X_3 = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}</math> (6M)</li> </ul>
4.	<p><b>Find the Eigen values and Eigen vectors of</b> <math>\begin{pmatrix} 2 &amp; 2 &amp; 1 \\ 1 &amp; 3 &amp; 1 \\ 1 &amp; 2 &amp; 2 \end{pmatrix}</math> (DEC/JAN-2014 R-13) (8M)</p> <p>BTL1 Answer : Refer Page No.1.15-Dr.M.CHANDRASEKAR</p> <ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 1, 1, 5</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}; X_2 = \begin{bmatrix} 0 \\ 1 \\ -2 \end{bmatrix}; X_3 = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}</math> (6M)</li> </ul>
5.	<p><b>Find the Eigen values and Eigen vectors of</b> <math>\begin{pmatrix} 6 &amp; -2 &amp; 2 \\ -2 &amp; 3 &amp; -1 \\ 2 &amp; -1 &amp; 3 \end{pmatrix}</math> (APR/MAY-2015 R-13)</p>

	<p><b>(8M) BTL1</b>  <b>Answer : Refer Page No.1.17-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 2, 2, 8</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}; X_2 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}; X_3 = \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}</math> (6M)</li> </ul>
6.	<p><b>Find the eigenvalues and the eigenvectors of the matrix <math>A = \begin{pmatrix} 8 &amp; -6 &amp; 2 \\ -6 &amp; 7 &amp; -4 \\ 2 &amp; -4 &amp; 3 \end{pmatrix}</math>. (APR/MAY 2019)(8M) BTL3</b></p> <ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 0, 3, 15</math> (4M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}; X_2 = \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}; X_3 = \begin{bmatrix} 2 \\ -2 \\ 1 \end{bmatrix}</math> (4M)</li> </ul>
7.	<p><b>Verify Cayley-Hamilton theorem and hence find the inverse of the matrix <math>\begin{pmatrix} 1 &amp; 2 &amp; -1 \\ 3 &amp; -3 &amp; 1 \\ 2 &amp; 1 &amp; -2 \end{pmatrix}</math> (DEC/JAN-2014 R-13) (8M) BTL3</b>  <b>Answer : Refer Page No.1.45-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>The Characteristic Equation is <math>\lambda^3 + 4\lambda^2 - 4\lambda - 12 = 0</math> (2 M)</li> <li>For Proving <math>A^3 + 4A^2 - 4A - 12I = 0</math> (3 M)</li> <li><math>A^{-1} = \frac{1}{12} \begin{pmatrix} 5 &amp; 3 &amp; -1 \\ 8 &amp; 0 &amp; -4 \\ 9 &amp; 3 &amp; -9 \end{pmatrix}</math> (3 M)</li> </ul>
8.	<p><b>Verify Cayley-Hamilton theorem and hence find the inverse of the matrix <math>\begin{pmatrix} 1 &amp; 0 &amp; 3 \\ 2 &amp; 1 &amp; -1 \\ 1 &amp; -1 &amp; 1 \end{pmatrix}</math> (DEC/JAN-2015 R-13) (8M) BTL3</b>  <b>Answer : Refer Page No.1.47-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>The Characteristic Equation is <math>\lambda^3 - 3\lambda^2 - \lambda + 9 = 0</math> (2 M)</li> <li>For Proving <math>A^3 - 3A^2 - A + 9I = 0</math>. (3)</li> </ul>

	<p><b>M)</b></p> <ul style="list-style-type: none"> <li>• <math>A^{-1} = \frac{-1}{9} \begin{pmatrix} 0 &amp; -3 &amp; -3 \\ -3 &amp; -2 &amp; 7 \\ -3 &amp; 1 &amp; 1 \end{pmatrix}</math>. (3 M)</li> </ul>
	<p><b>Using Cayley-Hamilton theorem to find the inverse of the matrix</b> <math>\begin{pmatrix} 1 &amp; 2 &amp; 1 \\ 2 &amp; 2 &amp; 1 \\ 1 &amp; 1 &amp; 3 \end{pmatrix}</math> (May/June-2018 R-17) (8M) BTL3</p> <p><b>Answer : Refer Page No.1.56-Dr.M.CHANDRASEKAR</b></p>
9.	<ul style="list-style-type: none"> <li>• The Characteristic Equation is <math>\lambda^3 - 6\lambda^2 + 5\lambda + 5 = 0</math> (2 M)</li> <li>• For Proving <math>A^3 - 6A^2 + 5A + 5I = 0</math> (3 M)</li> </ul> <ul style="list-style-type: none"> <li>• <math>A^{-1} = \frac{-1}{5} \begin{pmatrix} -5 &amp; 5 &amp; 0 \\ 5 &amp; -2 &amp; -1 \\ 0 &amp; -1 &amp; 2 \end{pmatrix}</math> (3 M)</li> </ul>
10.	<p><b>Use Cayley-Hamilton theorem to find the <math>A^4</math> of the matrix</b> <math>\begin{pmatrix} 2 &amp; -1 &amp; 1 \\ 0 &amp; 1 &amp; 2 \\ 1 &amp; 0 &amp; 1 \end{pmatrix}</math> (DEC/JAN-2016 R-13) (8M) BTL3</p> <p><b>Answer : Refer Page No.1.48-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• The Characteristic Equation is <math>\lambda^3 - 4\lambda^2 + 4\lambda + 1 = 0</math> (2 M)</li> <li>• <math>A^4 = \begin{pmatrix} 22 &amp; -19 &amp; -5 \\ 24 &amp; -9 &amp; 14 \\ 19 &amp; -12 &amp; 3 \end{pmatrix}</math> (6 M)</li> </ul>
11.	<p><b>Use Cayley-Hamilton theorem to find <math>A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I</math> of <math>A = \begin{pmatrix} 2 &amp; 1 &amp; 1 \\ 0 &amp; 1 &amp; 0 \\ 1 &amp; 1 &amp; 2 \end{pmatrix}</math></b> (DEC/JAN-2006,APR/MAY 2005) (8M) BTL3</p> <p><b>Answer : Refer Page No.1.51-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• The Characteristic Equation is <math>\lambda^3 - 5\lambda^2 + 7\lambda - 3 = 0</math> (2 M)</li> <li>• For Proving <math>A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I = A^2 + A + I</math> (3 M)</li> </ul>

	<ul style="list-style-type: none"> <li><math>A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I = \begin{pmatrix} 8 &amp; 5 &amp; 5 \\ 0 &amp; 3 &amp; 0 \\ 5 &amp; 5 &amp; 8 \end{pmatrix}</math> (3 M)</li> </ul>
	<p><b>Reduce the quadratic form <math>2xy-2yz+2xz</math> into a canonical form by an orthogonal reduction. (APR/MAY 2019)(16M) BTL3</b></p> <p><b>Answer : Refer Page No.1.119-Dr.G. BALAJI</b></p>
12.	<ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 1, 1, -2</math> (4 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}, X_2 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, X_3 = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}</math>, (4 M)</li> <li><math>D = \begin{pmatrix} 1 &amp; 0 &amp; 0 \\ 0 &amp; 1 &amp; 0 \\ 0 &amp; 0 &amp; -2 \end{pmatrix}</math> (6 M)</li> <li>Canonical form = <math>-2y_1^2 + y_2^2 + y_3^2</math>. (2 M)</li> </ul>
	<p><b>Diagonalize <math>A = \begin{pmatrix} 8 &amp; -6 &amp; 2 \\ -6 &amp; 7 &amp; -4 \\ 2 &amp; -4 &amp; 3 \end{pmatrix}</math> by means of orthogonal transformation.(12M) BTL1</b></p> <p><b>Answer : Refer Page No.1.72-Dr.M.CHANDRASEKAR</b></p>
13.	<ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 0, 3, 15</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}; X_2 = \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}; X_3 = \begin{bmatrix} 2 \\ -2 \\ 1 \end{bmatrix}</math>, (4 M)</li> <li><math>D = N^T A N = \begin{pmatrix} 0 &amp; 0 &amp; 0 \\ 0 &amp; 3 &amp; 0 \\ 0 &amp; 0 &amp; 15 \end{pmatrix}</math> (6 M)</li> </ul>
	<p><b>Diagonalize <math>A = \begin{pmatrix} 3 &amp; 1 &amp; 1 \\ 1 &amp; 3 &amp; -1 \\ 1 &amp; -1 &amp; 3 \end{pmatrix}</math> by means of orthogonal transformation. (12M) BTL1</b></p> <p><b>Answer : Refer Page No.1.77-Dr.M.CHANDRASEKAR</b></p>
14.	<ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 1, 4, 4</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}; X_2 = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}; X_3 = \begin{bmatrix} -1 \\ 1 \\ -2 \end{bmatrix}</math>, (4 M)</li> </ul>

	<ul style="list-style-type: none"> <li><math>D = N^T A N = \begin{pmatrix} 1 &amp; 0 &amp; 0 \\ 0 &amp; 4 &amp; 0 \\ 0 &amp; 0 &amp; 4 \end{pmatrix}</math> (6M)</li> </ul>
	<p><b>Diagonalize <math>A = \begin{pmatrix} 6 &amp; -2 &amp; 2 \\ -2 &amp; 3 &amp; -1 \\ 2 &amp; -1 &amp; 3 \end{pmatrix}</math> by means of orthogonal transformation.</b> BTL1</p> <p><b>(DEC/JAN-2015 R-13) (12M)</b></p> <p><b>Answer : Refer Page No.1.87-Dr.M.CHANDRASEKAR</b></p>
15.	<ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 2, 2, 8</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}; X_2 = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}; X_3 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}</math> (4M)</li> <li><math>D = N^T A N = \begin{pmatrix} 8 &amp; 0 &amp; 0 \\ 0 &amp; 2 &amp; 0 \\ 0 &amp; 0 &amp; 2 \end{pmatrix}</math> (6M)</li> </ul>
16.	<p><b>Reduce the quadratic form <math>10x_1^2 + 2x_2^2 + 5x_3^2 + 6x_2x_3 - 10x_3x_1 - 4x_1x_2</math> to a canonical form.</b></p> <p><b>Discuss its nature.(16M) BTL1</b></p> <p><b>Answer : Refer Page No.1.99-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 0, 3, 14</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ -5 \\ 4 \end{bmatrix}; X_2 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}; X_3 = \begin{bmatrix} 3 \\ -1 \\ -2 \end{bmatrix}</math> (4M)</li> <li><math>D = N^T A N = \begin{pmatrix} 0 &amp; 0 &amp; 0 \\ 0 &amp; 3 &amp; 0 \\ 0 &amp; 0 &amp; 14 \end{pmatrix}</math> (6M)</li> <li>Canonical form = <math>0y_1^2 + 3y_2^2 + 14y_3^2</math>. (2 M)</li> <li>Rank=2, Index=2, Signature=2; Nature = Positive Semi definite. (2 M)</li> </ul>
17.	<p><b>Reduce the quadratic form <math>6x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3 + 4x_3x_1 - 4x_1x_2</math> to a canonical form.</b></p> <p><b>Discuss its nature.(DEC/JAN-2016, JAN-2014 R-13) (16M) BTL1</b></p> <p><b>Answer : Refer Page No.1.102-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 2, 2, 8</math> (2 M)</li> </ul>

	<ul style="list-style-type: none"> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}; X_2 = \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}; X_3 = \begin{bmatrix} 2 \\ -1 \\ -5 \end{bmatrix}</math> (4M)</li> <li><math>D = N^T A N = \begin{pmatrix} 2 &amp; 0 &amp; 0 \\ 0 &amp; 2 &amp; 0 \\ 0 &amp; 0 &amp; 8 \end{pmatrix}</math> (6M)</li> <li>Canonical form <math>= 2y_1^2 + 2y_2^2 + 8y_3^2</math> (2 M)</li> <li>Rank=3, Index=3, Signature=3; Nature = Positive definite (2 M)</li> </ul>
18.	<p><b>Reduce the quadratic form <math>6x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3 + 4x_3x_1 - 4x_1x_2</math> to a canonical form by orthogonal reduction. (16M) BTL1</b></p> <p><b>Answer : Refer Page No.1.104-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = 2, 3, 6</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}; X_2 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}; X_3 = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}</math> (4M)</li> <li><math>D = N^T A N = \begin{pmatrix} 2 &amp; 0 &amp; 0 \\ 0 &amp; 3 &amp; 0 \\ 0 &amp; 0 &amp; 6 \end{pmatrix}</math> (8M)</li> <li>Canonical form <math>= 2y_1^2 + 3y_2^2 + 6y_3^2</math> (2 M)</li> </ul>
19.	<p><b>Reduce the quadratic form <math>x^2 + 5y^2 + z^2 + 2xy + 2yz + 6zx</math> to a canonical form through an orthogonal transformation. (DEC/JAN-2015 R-13) (16M) BTL1</b></p> <p><b>Answer : Refer Page No.1.109-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>The Eigen values are <math>\lambda = -2, 3, 6</math> (2 M)</li> <li>Eigen vectors <math>X_1 = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}; X_2 = \begin{bmatrix} -1 \\ 1 \\ -1 \end{bmatrix}; X_3 = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}</math> (4M)</li> <li><math>D = N^T A N = \begin{pmatrix} -2 &amp; 0 &amp; 0 \\ 0 &amp; 3 &amp; 0 \\ 0 &amp; 0 &amp; 6 \end{pmatrix}</math> (8M)</li> <li>Canonical form <math>= -2y_1^2 + 3y_2^2 + 6y_3^2</math> (2 M)</li> </ul>
20.	<p><b>Reduce the quadratic form <math>8x_1^2 + 7x_2^2 + 3x_3^2 - 8x_2x_3 + 4x_3x_1 - 12x_1x_2</math> to a canonical form by orthogonal reduction. (16M) BTL1</b></p>

**Answer : Refer Page No.1.111-Dr.M.CHANDRASEKAR**

- The Eigen values are  $\lambda = 0, 3, 15$  (2 M)

- Eigen vectors  $X_1 = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}; X_2 = \begin{bmatrix} 2 \\ 1 \\ -2 \end{bmatrix}; X_3 = \begin{bmatrix} 2 \\ -2 \\ 1 \end{bmatrix}$  (4M)

- $D = N^T A N = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 15 \end{pmatrix}$  (8M)

- Canonical form =  $0y_1^2 + 3y_2^2 + 15y_3^2$  (2 M)

**Reduce the quadratic form  $2x_1^2 + 5x_2^2 + 3x_3^2 + 4x_1x_2$  to a canonical form by orthogonal reduction. (May/June-2018 R-17) (16M) BTL1**

**Answer : Refer Page No.1.113-Dr.M.CHANDRASEKAR**

- The Eigen values are  $\lambda = 1, 3, 6$  (2 M)

- Eigen vectors  $X_1 = \begin{bmatrix} 2 \\ -1 \\ 0 \end{bmatrix}; X_2 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}; X_3 = \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}$  (4M)

- $D = N^T A N = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 6 \end{pmatrix}$  (8M)

- Canonical form =  $1y_1^2 + 3y_2^2 + 6y_3^2$  (2 M)

**Reduce the quadratic form  $x_1^2 + 2x_2^2 + x_3^2 + 2x_2x_3 - 2x_1x_2$  to a canonical form through orthogonal transformation and hence show that it is positive semi-definite. Also give a non-zero set of values  $(x_1, x_2, x_3)$  which makes this quadratic form zero (16M) BTL1**

**Answer : Refer Page No.1.121-Dr.M.CHANDRASEKAR**

- The Eigen values are  $\lambda = 0, 1, 3$  (2 M)

- Eigen vectors  $X_1 = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}; X_2 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}; X_3 = \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix}$  (4M)

- $D = N^T A N = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{pmatrix}$  (6M)

	<ul style="list-style-type: none"> <li>• Canonical form = <math>0y_1^2 + 1y_2^2 + 3y_3^2</math> (<b>2 M</b>)</li> <li>• <math>x_1 = 1, x_2 = 1, x_3 = -1</math> which makes Q.F is zero (<b>1 M</b>)</li> <li>• For proving Positive Semi definite (<b>1 M</b>)</li> </ul>
<b>UNIT-II VECTOR CALCULUS</b>	
	Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface – Volume integral – Green's, Gauss divergence and Stokes theorems – Verification and application in evaluating line, surface and volume integrals.
<b>PART-A</b>	
1	<p><b>State Stokes theorem. (DEC/JAN-2015)BTL1</b></p> <p>The surface integral of the normal component of the curl of a vector point function <math>\vec{F}</math> over an open surface 'S' is equal to the line integral of the tangential component of <math>\vec{F}</math> around the closed curve 'C' bounding 'S'</p> $\int_C \vec{F} \cdot d\vec{r} = \iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds$
2	<p><b>State Gauss divergence theorem. (DEC/JAN-2013) (NOV/DEC-2015)BTL1</b></p> <p>The surface integral of the normal component of a vector function <math>\vec{F}</math> over a closed surface S enclosing volume V is equal to the volume integral of the divergence of <math>\vec{F}</math> taken throughout the volume V <math>\iint_S \vec{F} \cdot \hat{n} ds = \iiint_V \nabla \cdot \vec{F} dv</math></p>
3	<p><b>State Green's theorem. (DEC/JAN-2009) (NOV/DEC-2010)BTL1</b></p> <p>If <math>u, v, \frac{\partial u}{\partial y}, \frac{\partial v}{\partial x}</math> are continuous and single valued functions in the region R enclosed by the curve C, then <math>\int_C u dx + v dy = \iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dx dy</math></p>
4	<p><b>Find curl <math>\vec{F}</math> if <math>\vec{F} = xy\vec{i} + yz\vec{j} + zx\vec{k}</math>.BTL1</b></p> $\begin{aligned} curl \vec{F} &= \nabla \times \vec{F} \\ &= \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ xy & yz & zx \end{vmatrix} \\ &= \vec{i}(0-y) - \vec{j}(z-0) + \vec{k}(0-x) \\ &= -y\vec{i} - z\vec{j} - x\vec{k} = -(y\vec{i} + z\vec{j} + x\vec{k}) \end{aligned}$
5	<p><b>Prove that <math>\vec{F} = yz\vec{i} + zx\vec{j} + xy\vec{k}</math> is irrotational.BTL5</b></p> $\begin{aligned} \nabla \times \vec{F} &= \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ yz & zx & xy \end{vmatrix} = \sum \vec{i} \left[ \frac{\partial}{\partial y} (xy) - \frac{\partial}{\partial z} (zx) \right] \\ &= \sum \vec{i} [x - x] = 0\vec{i} + 0\vec{j} + 0\vec{k} = \vec{0}. \text{ Hence, } \vec{F} \text{ is irrotational.} \end{aligned}$

	<b>Is the position vector <math>\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}</math> irrotational? Justify. (DEC/JAN-2016) BTL5</b>
6	$\nabla \times \vec{r} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ x & y & z \end{vmatrix}$ $= \vec{i} \left[ \frac{\partial}{\partial y}(z) - \frac{\partial}{\partial z}(y) \right] - \vec{j} \left[ \frac{\partial}{\partial x}(z) - \frac{\partial}{\partial z}(x) \right] + \vec{k} \left[ \frac{\partial}{\partial x}(y) - \frac{\partial}{\partial y}(x) \right]$ $= 0\vec{i} + 0\vec{j} + 0\vec{k} = \vec{0}.$ <p>Hence, <math>\vec{r}</math> is irrotational.</p>
7	<b>Prove that <math>3x^2y\vec{i} + (yz - 3xy^2)\vec{j} - \frac{z^2}{2}\vec{k}</math> is a solenoidal. BTL5</b> $\nabla \cdot \vec{F} = \frac{\partial}{\partial x}(3x^2y) + \frac{\partial}{\partial y}(yz - 3xy^2) + \frac{\partial}{\partial z}\left(-\frac{z^2}{2}\right)$ $= (6xy) + (z - 6xy) + \left(\frac{-2z}{2}\right) = 0$ <p><math>\therefore \vec{F}</math> is Solenoidal.</p>
	<b>Show that <math>\vec{F} = (y^2 - z^2 + 3yz - 2x)\vec{i} + (3xz + 2xy)\vec{j} + (3xy - 2xz + 2z)\vec{k}</math> is both solenoidal and irrotational. BTL2</b> $\nabla \cdot \vec{F} = \frac{\partial}{\partial x}(y^2 - z^2 + 3yz - 2x) + \frac{\partial}{\partial y}(3xz + 2xy) + \frac{\partial}{\partial z}(3xy - 2xz + 2z)$ $= (-2) + (2x) + (-2x + 2)$ $= 0$ <p><math>\therefore \vec{F}</math> is Solenoidal.</p>
8	$\nabla \times \vec{F} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ y^2 - z^2 + 3yz - 2x & 3xz + 2xy & 3xy - 2xz + 2z \end{vmatrix}$ $= \vec{i} \left[ \frac{\partial}{\partial y}(3xy - 2xz + 2z) - \frac{\partial}{\partial z}(3xz + 2xy) \right]$ $- \vec{j} \left[ \frac{\partial}{\partial x}(3xy - 2xz + 2z) - \frac{\partial}{\partial z}(y^2 - z^2 + 3yz - 2x) \right]$ $+ \vec{k} \left[ \frac{\partial}{\partial x}(3xz + 2xy) - \frac{\partial}{\partial y}(y^2 - z^2 + 3yz - 2x) \right]$ $= [3x - 3x]\vec{i} - [(3y - 2z) - (-2z + 3y)]\vec{j} + [(3z + 2y) - (2y + 3z)]\vec{k}$ $\nabla \times \vec{F} = 0\vec{i} + 0\vec{j} + 0\vec{k} = \vec{0}$ <p>Hence, <math>\vec{F}</math> is irrotational.</p>
9	<b>Find <math>\alpha</math> such that <math>\vec{F} = (3x - 2y + z)\vec{i} + (4x + \alpha y - z)\vec{j} + (x - y + 2z)\vec{k}</math> is solenoidal. BTL1</b> <p>Given <math>\nabla \cdot \vec{F} = 0</math></p> $\frac{\partial}{\partial x}(3x - 2y + z) + \frac{\partial}{\partial y}(4x + \alpha y - z) + \frac{\partial}{\partial z}(x - y + 2z) = 0$ $3 + \alpha + 2 = 0$ $\alpha + 5 = 0 \therefore \alpha = -5$

	<p><b>Find the constants <math>a, b, c</math> so that <math>\vec{F} = (x + 2y + az)\vec{i} + (bx - 3y - z)\vec{j} + (4x + cy + 2z)\vec{k}</math> is irrotational.(DEC/JAN-2012) (May/June-2018 R-17)BTL1</b></p> $\nabla \times \vec{F} = \vec{0}$
10	$\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ x + 2y + az & bx - 3y - z & 4x + cy + 2z \end{vmatrix} = \vec{0}$ $\vec{i}[c + 1] - \vec{j}[4 - a] + \vec{k}[b - 2] = 0\vec{i} - 0\vec{j} + 0\vec{k}$ <p>i.e., <math>c + 1 = 0, 4 - a = 0, b - 2 = 0</math></p> $\therefore c = -1, a = 4, b = 2$
	<p><b>Prove that <math>\text{div } \vec{r} = 3</math> and <math>\text{curl } \vec{r} = \vec{0}</math>.(DEC/JAN-2016) (NOV/DEC-2010) BTL5</b></p> $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ $\nabla \cdot \vec{r} = \frac{\partial}{\partial x}(x) + \frac{\partial}{\partial y}(y) + \frac{\partial}{\partial z}(z) = 1 + 1 + 1 = 3$
11	$\nabla \times \vec{r} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ x & y & z \end{vmatrix}$ $= \vec{i}\left[\frac{\partial}{\partial y}(z) - \frac{\partial}{\partial z}(y)\right] - \vec{j}\left[\frac{\partial}{\partial x}(z) - \frac{\partial}{\partial z}(x)\right] + \vec{k}\left[\frac{\partial}{\partial x}(y) - \frac{\partial}{\partial y}(x)\right]$ $= 0\vec{i} + 0\vec{j} + 0\vec{k} = \vec{0}$
12	<p><b>Prove that <math>\text{curl}(\text{grad } \phi) = \vec{0}</math> . (NOV/DEC-2008)</b> BTL5</p> $\begin{aligned} \text{grad } \phi &= \nabla \phi \\ &= \vec{i} \frac{\partial \phi}{\partial x} + \vec{j} \frac{\partial \phi}{\partial y} + \vec{k} \frac{\partial \phi}{\partial z} \\ \text{curl}(\text{grad } \phi) &= \nabla \times (\nabla \phi) \\ &= \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ \frac{\partial \phi}{\partial x} & \frac{\partial \phi}{\partial y} & \frac{\partial \phi}{\partial z} \end{vmatrix} \\ &= \sum \vec{i} \left[ \frac{\partial^2 \phi}{\partial y \partial z} - \frac{\partial^2 \phi}{\partial z \partial y} \right] \\ &= \sum \vec{i} [0] \text{ (Since mixed partial derivatives are equal)} \\ &= 0\vec{i} + 0\vec{j} + 0\vec{k} = \vec{0} \end{aligned}$
13	<p><b>In what direction from <math>(3, 1, -2)</math> is the directional derivative of <math>\phi = x^2y^2z^4</math> maximum?</b></p> <p><b>Find also the magnitude of this maximum.BTL1</b></p> $\begin{aligned} \nabla \phi &= \vec{i} \frac{\partial \phi}{\partial x} + \vec{j} \frac{\partial \phi}{\partial y} + \vec{k} \frac{\partial \phi}{\partial z} \\ &= \vec{i}[2xy^2z^4] + \vec{j}[2x^2yz^4] + \vec{k}[4x^2y^2z^3] \end{aligned}$

$$\begin{aligned}\nabla \varphi_{(3,1,-2)} &= \vec{i} [2(3)(1)(16)] + \vec{j} [2(9)(1)(16)] + \vec{k} [4(9)(1)(-8)] \\ &= 96\vec{i} + 288\vec{j} - 288\vec{k} \\ &= 96(\vec{i} + 3\vec{j} - 3\vec{k})\end{aligned}$$

The directional derivative is maximum in the direction of  $96(\vec{i} + 3\vec{j} - 3\vec{k})$

$$\begin{aligned}\text{Maximum value is } |\nabla \varphi| &= |96(\vec{i} + 3\vec{j} - 3\vec{k})| \\ &= \sqrt{92^2(1+9+9)} \\ &= 96\sqrt{19}\end{aligned}$$

**Find the unit vector normal to the surface  $x^2 + y^2 = z$  at  $(1, -2, 5)$ .** BTL1

Given  $\phi = x^2 + y^2 - z$

$$\text{Unit normal vector } \hat{n} = \frac{\nabla \phi}{|\nabla \phi|} \dots \quad (1)$$

$$\begin{aligned}\nabla \phi &= \vec{i} \frac{\partial \phi}{\partial x} + \vec{j} \frac{\partial \phi}{\partial y} + \vec{k} \frac{\partial \phi}{\partial z} \\ &= \vec{i}[2x] + \vec{j}[2y] + \vec{k}[-1]\end{aligned}$$

$$\begin{aligned}\nabla \phi_{(1,-2,5)} &= \vec{i}[2] + \vec{j}[-4] + \vec{k}[-1] \\ &= 2\vec{i} - 4\vec{j} - \vec{k} \\ |\nabla \phi| &= \sqrt{2^2 + (-4)^2 + (-1)^2} \\ &= \sqrt{4 + 16 + 1} = \sqrt{21}\end{aligned}$$

$$\therefore (1) \Rightarrow \hat{n} = \frac{2\vec{i} - 4\vec{j} - \vec{k}}{\sqrt{21}}$$

**Find the greatest rate of increase of  $\phi = xyz^2$  at  $(1, 0, 3)$ .** BTL1

$$\begin{aligned}\nabla \phi &= \vec{i} \frac{\partial \phi}{\partial x} + \vec{j} \frac{\partial \phi}{\partial y} + \vec{k} \frac{\partial \phi}{\partial z} \\ &= \vec{i}[yz^2] + \vec{j}[xz^2] + \vec{k}[2xyz] \\ \nabla \phi_{(1,0,3)} &= 0\vec{i} + 9\vec{j} + 0\vec{k}\end{aligned}$$

$$\therefore \text{Greatest rate of increase} = |\nabla \phi| = \sqrt{9^2} = 9$$

**State the physical interpretation of the line integral.  $\int_A^B \vec{F} \cdot d\vec{r}$ .** BTL1

Physically  $\int_A^B \vec{F} \cdot d\vec{r}$  denotes the total work done by the force  $\vec{F}$ , in displacing a particle from A to B along the curve C.

**Define Solenoidal vector function. If  $\vec{V} = (x+3y)\vec{i} + (y-2z)\vec{j} + (x+2\lambda z)\vec{k}$  is Solenoidal, find the value of  $\lambda$ .** BTL1

If  $\operatorname{div} \vec{F} = 0$ , then  $\vec{F}$  is said to be Solenoidal vector.  $\nabla \cdot \vec{F} = 0$ .

	$\begin{aligned}\nabla \cdot \vec{V} &= \frac{\partial}{\partial x}(x+3y) + \frac{\partial}{\partial y}(y-2z) + \frac{\partial}{\partial z}(x+2\lambda z) \\ &= 1+1+2\lambda \\ &= 2+2\lambda \\ \nabla \cdot \vec{V} &= 0 \\ 2+2\lambda &= 0 \\ \lambda &= -1\end{aligned}$
18	<p><b>Find grad(r^n)</b> where <math>\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}</math> and <math>\vec{r} =  \vec{r} </math>. BTL1</p> <p>We know that <math>\frac{\partial r}{\partial x} = \frac{x}{r}</math>, <math>\frac{\partial r}{\partial y} = \frac{y}{r}</math>, <math>\frac{\partial r}{\partial z} = \frac{z}{r}</math></p> $\begin{aligned}grad(r^n) &= \sum i \frac{\partial r^n}{\partial x} \\ &= \sum i (nr^{n-1}) \frac{\partial r}{\partial x} \\ &= (nr^{n-2}) \vec{r}\end{aligned}$
19	<p><b>Find grad(r) and grad(1/r)</b> where <math>\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}</math> and <math>\vec{r} =  \vec{r} </math>. BTL1</p> $\begin{aligned}\nabla \phi &= \sum i \frac{\partial \phi}{\partial x} = \frac{\Sigma x\vec{i}}{r} \\ &= \frac{\vec{r}}{r} \\ grad(\frac{1}{r}) &= \sum i \frac{\partial \left(\frac{1}{r}\right)}{\partial x} = \left(-\frac{1}{r^2}\right) \frac{\Sigma x\vec{i}}{r} \\ &= \frac{-\vec{r}}{r^3}\end{aligned}$
20	<p><b>Find the unit normal to the surface <math>x^2 + xy + z^2 = 4</math> at <math>(1, -1, 2)</math>.</b> BTL1</p> $\begin{aligned}\hat{n} &= \frac{\nabla \phi}{ \nabla \phi } \\ \nabla \phi &= \sum i \frac{\partial \phi}{\partial x} \\ Given: & \\ x^2 + xy + z^2 &= 4 \text{ Point}(1, -1, 2) \\ \nabla \phi &= \vec{i} + \vec{j} + 4\vec{k} \\  \nabla \phi  &= \sqrt{1+1+16} = \sqrt{18} \\ \hat{n} &= \frac{\vec{i} + \vec{j} + 4\vec{k}}{3\sqrt{2}}\end{aligned}$

	<b>Prove by Green's theorem that the area bounded by a simple closed curve is</b> $\frac{1}{2} \int_C (xdy - ydx)$ <p style="text-align: center;">BTL5</p>
21	By Green's theorem: $\int_C u dx + v dy = \iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dxdy$ $u = \frac{-y}{2}, v = \frac{x}{2} \Rightarrow \frac{\partial u}{\partial y} = \frac{-1}{2}, \frac{\partial v}{\partial x} = \frac{1}{2}$ <p>Given that</p> $\frac{1}{2} \int_C xdy - ydx = \iint_R \left( \frac{1}{2} + \frac{1}{2} \right) dxdy$ $= \iint_R dxdy. \text{ which a area bounded by a simple closed curve 'c'}$
22	<b>Find</b> $\nabla \left[ \nabla \cdot ((x^2 - yz)\vec{i} + (y^2 - xz)\vec{j} + (z^2 - xy)\vec{k}) \right]$ <b>at the point (1,-1,2).</b> BTL1 $\nabla \cdot \vec{F} = \frac{\partial}{\partial x}(x^2 - yz) + \frac{\partial}{\partial y}(y^2 - xz) + \frac{\partial}{\partial z}(z^2 - xy)$ $= 2x + 2y + 2z$ $\nabla \cdot \vec{F}_{(1,-1,2)} = 2 - 2 + 4$ $= 4$ $\text{Grad}(\nabla \cdot \vec{F}) = \nabla(\nabla \cdot \vec{F})$ $= \vec{i} \frac{\partial}{\partial x}(2x) + \vec{j} \frac{\partial}{\partial y}(2y) + \vec{k} \frac{\partial}{\partial z}(2z)$ $= 2\vec{i} + 2\vec{j} + 2\vec{k}$
23	<b>Find the directional directive of</b> $\phi(x, y, z) = xy^2 + yz^2$ <b>at the point (2,-1,1) in the direction of the vector</b> $\vec{i} + 2\vec{j} + 3\vec{k}$ . (DEC/JAN-2014) BTL1 <p>Directional derivative(D.D)= <math>\nabla \phi \cdot \frac{\vec{a}}{ \vec{a} }</math></p> <p>Given :</p> $\phi(x, y, z) = xy^2 + z^2 y, \quad \vec{a} = \vec{i} + 2\vec{j} + 3\vec{k}$ $\nabla \phi_{(2,-1,1)} = \vec{i} + 2\vec{j} + 4\vec{k}, \quad  \vec{a}  = \sqrt{14}$ $D.D = (\vec{i} + 2\vec{j} + 4\vec{k}) \cdot \frac{(\vec{i} + 2\vec{j} + 3\vec{k})}{\sqrt{14}}$ $= \frac{17}{\sqrt{14}}.$

	<p>If <math>\vec{F}</math> is irrotational and C is closed curve then find the value of <math>\int_C \vec{F} \cdot d\vec{r}</math>. BTL1</p> <p>By Stokes theorem <math>\int_C \vec{F} \cdot d\vec{r} = \iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds</math></p> <p>Since <math>\vec{F}</math> is irrotational <math>\therefore \nabla \times \vec{F} = 0</math></p> $\begin{aligned} \int_C \vec{F} \cdot d\vec{r} &= \iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds \\ &= \iint_S 0 \cdot \hat{n} ds \\ &= 0 \end{aligned}$
24	<p><b>Prove that</b> <math>\nabla(\log r) = \frac{\vec{r}}{r^2}</math>. (NOV/DEC-2014).BTL5</p> <p>we have <math>\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}</math> and <math>r =  \vec{r}  = \sqrt{x^2 + y^2 + z^2}</math></p> $r^2 = x^2 + y^2 + z^2, \frac{\partial r}{\partial x} = \frac{x}{r}, \frac{\partial r}{\partial y} = \frac{y}{r}, \frac{\partial r}{\partial z} = \frac{z}{r}$ $\begin{aligned} \nabla(\log r) &= \vec{i} \frac{\partial(\log r)}{\partial x} + \vec{j} \frac{\partial(\log r)}{\partial y} + \vec{k} \frac{\partial(\log r)}{\partial z} \\ &= \vec{i} \left( \frac{1}{r} \frac{\partial r}{\partial x} \right) + \vec{j} \left( \frac{1}{r} \frac{\partial r}{\partial y} \right) + \vec{k} \left( \frac{1}{r} \frac{\partial r}{\partial z} \right) \\ &= \frac{1}{r} \left[ \frac{x}{r} \vec{i} + \frac{y}{r} \vec{j} + \frac{z}{r} \vec{k} \right] \\ &= \frac{1}{r^2} [x\vec{i} + y\vec{j} + z\vec{k}] = \frac{\vec{r}}{r^2} \end{aligned}$
25	<p>If <math>\vec{F} = (x^3)\vec{i} + (y^3)\vec{j} + (z^3)\vec{k}</math> then find div curl <math>\vec{F}</math> . (May/June-2018 R-17)BTL1</p> $\nabla \times \vec{F} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ x^3 & y^3 & z^3 \end{vmatrix} = 0 \text{ Therefore } \text{div curl } \vec{F} = 0$
	<b>PART-B</b>
	<p><b>Prove that</b> <math>\nabla(r^n) = nr^{n-2} \vec{r}</math>. (May/June 2003,2008) (8 M) BTL5</p> <p><b>Answer : Refer Page No.2.5-Dr.M.CHANDRASEKAR</b></p> <ol style="list-style-type: none"> <li>• <math>\frac{\partial r}{\partial x} = \frac{x}{r}, \frac{\partial r}{\partial y} = \frac{y}{r}, \frac{\partial r}{\partial z} = \frac{z}{r}</math>. (2 M)</li> <li>• <math>\nabla(r^n) = \vec{i} \left( nr^{n-1} \frac{\partial r}{\partial x} \right) + \vec{j} \left( nr^{n-1} \frac{\partial r}{\partial y} \right) + \vec{k} \left( nr^{n-1} \frac{\partial r}{\partial z} \right)</math> (2 M)</li> <li>• <math>\nabla(r^n) = \frac{nr^{n-1}}{r} [x\vec{i} + y\vec{j} + z\vec{k}] = nr^{n-2} \vec{r}</math> (4M)</li> </ol>

**Prove that  $\text{Curl}(\text{Curl } \vec{F}) = \nabla(\text{div } \vec{F}) - \nabla^2 \vec{F}$ . (May/June 2003,2008) (8 M)**  
**Answer : Refer Page No.2.36-Dr.M.CHANDRASEKAR**

BTL5

2.

- $$\nabla \times (\nabla \times \vec{F}) = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ \frac{\partial F_3}{\partial y} - \frac{\partial F_2}{\partial z} & \frac{\partial F_1}{\partial z} - \frac{\partial F_3}{\partial x} & \frac{\partial F_2}{\partial x} - \frac{\partial F_1}{\partial y} \end{vmatrix} \quad (3M)$$

- $$\nabla \times (\nabla \times \vec{F}) = \sum \left\{ \frac{\partial}{\partial x} (\text{div } \vec{F}) - \nabla^2 \vec{F}_1 \right\} \vec{i} \quad (3M)$$

- For proving

$$\text{Curl}(\text{Curl } \vec{F}) = \nabla(\text{div } \vec{F}) - \nabla^2 \vec{F} \quad (2M)$$

**Prove that  $\vec{F} = (y^2 \cos x + z^3) \vec{i} + (2y \sin x - 4) \vec{j} + 3xz^2 \vec{k}$  is irrotational and find its scalar potential. (8 M) BTL5**

**Answer : Refer Page No.2.33-Dr.M.CHANDRASEKAR**

3.

- $$\nabla \times \vec{F} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ y^2 \cos x + z^3 & 2y \sin x - 4 & 3xz^2 \end{vmatrix} = 0 \quad (2M)$$

$$\phi_1 = y^2 \sin x + xz^3 + f(y, z)$$

- $$\phi_2 = y^2 \sin x - 4y + f(x, z) \quad (4M)$$

$$\phi_3 = xz^3 + f(x, y)$$

- $$\phi = y^2 \sin x + xz^3 - 4y + c \quad (2M)$$

**Prove that  $\vec{F} = (6xy + z^3) \vec{i} + (3x^2 - z) \vec{j} + (3xz^2 - y) \vec{k}$  is irrotational and find its scalar potential.(NOV/DEC 2015,R-13)(8 M) BTL5**

**Answer : Refer Page No.2.32-Dr.M.CHANDRASEKAR**

4.

- $$\nabla \times \vec{F} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ (6xy + z^3) & (3x^2 - z) & (3xz^2 - y) \end{vmatrix} = 0 \quad (2M)$$

$$\phi_1 = 3x^2 y + xz^3 + f(y, z)$$

- $$\phi_2 = 3x^2 y - yz + f(x, z) \quad (4M)$$

$$\phi_3 = xz^3 - yz + f(x, y)$$

	<ul style="list-style-type: none"> <li><math>\phi = 3x^2y + xz^3 - yz + c</math> (2M)</li> </ul>
	<p><b>Prove that <math>\vec{F} = (y^2 + 2xz^2)\vec{i} + (2xy - z)\vec{j} + (2zx^2 - y + 2z)\vec{k}</math> is irrotational and find its scalar potential. (8 M) BTL5</b></p> <p><b>Answer : Refer Page No.2.47-Dr.M.CHANDRASEKAR</b></p>
5.	<ul style="list-style-type: none"> <li><math>\nabla \times \vec{F} = \begin{vmatrix} \vec{i} &amp; \vec{j} &amp; \vec{k} \\ \partial/\partial x &amp; \partial/\partial y &amp; \partial/\partial z \\ (y^2 + 2xz^2) &amp; (2xy - z) &amp; (2zx^2 - y + 2z) \end{vmatrix} = 0</math> (2 M)</li> </ul> $\phi_1 = xy^2 + x^2z^2 + f(y, z)$ <ul style="list-style-type: none"> <li><math>\phi_2 = xy^2 - yz + f(x, z)</math> (4M)</li> </ul> $\phi_3 = x^2z^2 + xy^2 - yz + f(x, y)$ <ul style="list-style-type: none"> <li><math>\phi = x^2z^2 + xy^2 - yz + c</math> (2M)</li> </ul>
6.	<p><b>Prove that <math>\vec{F} = (y + z)\vec{i} + (z + x)\vec{j} + (x + y)\vec{k}</math> is irrotational and find its scalar potential. (8 M) BTL5</b></p> <p><b>Answer : Refer Page No.2.46-Dr.M.CHANDRASEKAR</b></p>
7.	<ul style="list-style-type: none"> <li><math>\nabla \times \vec{F} = \begin{vmatrix} \vec{i} &amp; \vec{j} &amp; \vec{k} \\ \partial/\partial x &amp; \partial/\partial y &amp; \partial/\partial z \\ (y + z) &amp; (z + x) &amp; (x + y) \end{vmatrix} = 0</math> (2 M)</li> </ul> $\phi_1 = xy + xz + f(y, z)$ <ul style="list-style-type: none"> <li><math>\phi_2 = xy + yz + f(x, z)</math> (4M)</li> </ul> $\phi_3 = xz + yz + f(x, y)$ <ul style="list-style-type: none"> <li><math>\phi = xz + xy + yz + c</math> (2M)</li> </ul>
	<p><b>Evaluate by Green's theorem <math>\int_C (xy + x^2)dx + (x^2 + y^2)dy</math> where C is the square formed by <math>x = -1, x = 1, y = -1, y = 1</math> (May/June 2016 R-13) (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.2.75-Dr.M.CHANDRASEKAR</b></p>
7.	<ul style="list-style-type: none"> <li><math display="block">\int_C u dx + v dy = \iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dx dy</math> (4M)  <math display="block">u = xy + x^2, v = x^2 + y^2 \Rightarrow \frac{\partial u}{\partial y} = x, \frac{\partial v}{\partial x} = 2x</math> </li> <li><math display="block">\int_C (xy + x^2)dx + (x^2 + y^2)dy = \int_{-1}^1 \int_{-1}^1 x dx dy</math> (2M)</li> </ul>

	<ul style="list-style-type: none"> <li>• <math>\int_C (xy + x^2)dx + (x^2 + y^2)dy = 0</math> (2M)</li> </ul>
	<p><b>Verify Green's theorem</b> <math>\int_C (xy + y^2)dx + (x^2)dy</math> where C is the closed curve of the region bounded by <math>y = x</math> and <math>y = x^2</math> (May/June 2013 R-13) (8 M) BTL3</p> <p>Answer : Refer Page No.2.78-Dr.M.CHANDRASEKAR</p>
8.	<ul style="list-style-type: none"> <li>• <math>\int_C udx + vdy = \iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dxdy</math> (2M)</li> <li>• <math>u = xy + y^2, v = x^2 \Rightarrow \frac{\partial u}{\partial y} = x + 2y, \frac{\partial v}{\partial x} = 2x</math></li> <li>• <math>\iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dxdy = \int_0^1 \int_y^{1/\sqrt{y}} (x - 2y) dx dy = \frac{-1}{20}</math> (2M)</li> <li>• <math>\int_C (xy + y^2)dx + (x^2)dy = \text{Along OA} + \text{Along AO} = \int_0^1 (x^4 + 3x^3) dx + \int_1^0 (3x^2) dx</math> (2M)</li> <li>• <math>\int_C (xy + y^2)dx + (x^2)dy = \frac{19}{20} - 1 = \frac{-1}{20}</math> (2M)</li> </ul>
9.	<p><b>Verify Green's theorem</b> <math>\int_C (x^2 - xy^3)dx + (y^2 - 2xy)dy</math> where C is the square with vertices (0,0),(2,0),(2,2),(0,2) (May/June 2003) (8 M) BTL3</p> <p>Answer : Refer Page No.2.80-Dr.M.CHANDRASEKAR</p> <ul style="list-style-type: none"> <li>• <math>\int_C udx + vdy = \iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dxdy</math> (2M)</li> <li>• <math>u = x^2 - xy^3, v = y^2 - 2xy \Rightarrow \frac{\partial u}{\partial y} = -3xy^2, \frac{\partial v}{\partial x} = -2y</math></li> <li>• <math>\iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dxdy = \int_0^2 \int_0^2 (3x y^2 - 2y) dx dy = 8</math> (2M)</li> <li>• <math>\int_C (x^2 - xy^3)dx + (y^2 - 2xy)dy = \text{Along OA} + \text{Along AB} + \text{Along BC} + \text{Along CO}</math></li> <li>• <math>= \int_0^2 (x^2) dx + \int_0^2 (y^2 - 4y) dy + \int_2^0 (x^2 - 8x) dx + \int_2^0 (y^2) dy</math> (2M)</li> <li>• <math>\int_C (x^2 - xy^3)dx + (y^2 - 2xy)dy = \frac{8}{3} - \frac{16}{3} + \frac{40}{3} - \frac{8}{3} = 8</math> (2M)</li> </ul>
10.	<b>Evaluate by Green's theorem</b> $\int_C (y - \sin x)dx + (\cos x)dy$ where C is the triangle OAB

where  $\mathbf{O} = (\mathbf{0}, \mathbf{0})$ ,  $A = \left(\frac{\pi}{2}, 0\right)$ ,  $B = \left(\frac{\pi}{2}, 1\right)$  (May/June 2015 R-13) (8 M) BTL3

Answer : Refer Page No.2.82-Dr.M.CHANDRASEKAR

- $$\int_C u dx + v dy = \iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dx dy \quad (4M)$$
- $$u = y - \sin x, v = \cos x \Rightarrow \frac{\partial u}{\partial y} = 1, \frac{\partial v}{\partial x} = -\sin x$$

- $$\int_C (y - \sin x) dx + (\cos x) dy = \int_0^{\frac{\pi}{2}} \int_0^{2x} (-\sin x - 1) dx dy \quad (2M)$$
- $$\int_C (y - \sin x) dx + (\cos x) dy = -\left( \frac{\pi^2 + 8}{4\pi} \right) \quad (2M)$$

Apply Green's theorem to evaluate  $\int_C (3x^2 - 8y^2) dx + (4y - 6xy) dy$  where C is the boundary of the region defined by  $x=0, y=0$  and  $x+y=1$  (NOV/DEC 2014 R-13) (8 M) BTL3

Answer : Refer Page No.2.83-Dr.M.CHANDRASEKAR

11.

- $$\int_C u dx + v dy = \iint_R \left( \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right) dx dy \quad (4M)$$
- $$u = -8y^2 + 3x^2, v = 4y - 6xy \Rightarrow \frac{\partial u}{\partial y} = -16y, \frac{\partial v}{\partial x} = -6y$$
- $$\int_C (3x^2 - 8y^2) dx + (4y - 6xy) dy = \int_0^1 \int_0^{1-y} 10y dx dy \quad (2M)$$
- $$\int_C (3x^2 - 8y^2) dx + (4y - 6xy) dy = \frac{5}{3} \quad (2M)$$

Verify Gauss Divergence theorem  $\vec{F} = xy^2 \vec{i} + yz^2 \vec{j} + zx^2 \vec{k}$  over the region bounded by  $x = 0, x = 1, y = 0, y = 2, z = 0, z = 3$  (May/June 2012 R-08)(16 M) BTL3

Answer : Refer Page No.2.96-Dr.M.CHANDRASEKAR

12.

- $$\iint_S \hat{\vec{F}} \cdot \hat{n} ds = \iiint_V \nabla \cdot \vec{F} dv \quad (2M)$$
- $$\nabla \cdot \vec{F} = y^2 + x^2 + z^2 \quad (2M)$$
- $$\iiint_V \nabla \cdot \vec{F} dv = \int_0^3 \int_0^2 \int_0^1 (y^2 + x^2 + z^2) dx dy dz = 28 \quad (4M)$$

	<ul style="list-style-type: none"> <li>• <math>\iint_S \vec{F} \cdot \hat{n} ds = 8 + 0 + 18 + 0 + 2 + 0 = 28</math> (8M)</li> </ul>
	<p><b>Verify Gauss Divergence theorem</b> <math>\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}</math> over the rectangular Parallelopiped <math>0 \leq x \leq a, 0 \leq y \leq b, 0 \leq z \leq c</math> (May/June 2009 R-08) (16 M) BTL3</p> <p><b>Answer :</b> Refer Page No.2.99-Dr.M.CHANDRASEKAR</p> <ul style="list-style-type: none"> <li>• <math>\iint_S \vec{F} \cdot \hat{n} ds = \iiint_V \nabla \cdot \vec{F} dv</math> (2M)</li> <li>• <math>\nabla \cdot \vec{F} = 2x + 2y + 2z</math> (2M)</li> </ul>
13.	<ul style="list-style-type: none"> <li>• <math>\iiint_V \nabla \cdot \vec{F} dv = 2 \int_0^c \int_0^b \int_0^a (x + y + z) dx dy dz = abc(a+b+c)</math> (4M)</li> </ul> $\iint_S \vec{F} \cdot \hat{n} ds = \left( a^2 bc - \frac{b^2 c^2}{4} \right) + \left( \frac{b^2 c^2}{4} \right) + \left( b^2 ac - \frac{a^2 c^2}{4} \right) + \left( \frac{a^2 c^2}{4} \right) + \left( c^2 ba - \frac{b^2 a^2}{4} \right) + \left( \frac{b^2 a^2}{4} \right) (8M)$ $\iint_S \vec{F} \cdot \hat{n} ds = abc(a+b+c)$
	<p><b>Verify Gauss Divergence theorem for</b> <math>\vec{F} = x^3 \vec{i} + y^3 \vec{j} + z^3 \vec{k}</math> over the cube bounded by <math>x = 0, x = a, y = 0, y = a, z = 0, z = a</math> (May/June 2014 R-13) (May/June-2018 R-17) (16 M) BTL3</p> <p><b>Answer :</b> Refer Page No.2.106-Dr.M.CHANDRASEKAR</p> <ul style="list-style-type: none"> <li>• <math>\iint_S \vec{F} \cdot \hat{n} ds = \iiint_V \nabla \cdot \vec{F} dv</math> (2M)</li> <li>• <math>\nabla \cdot \vec{F} = 3y^2 + 3x^2 + 3z^2</math> (2M)</li> </ul> $\iiint_V \nabla \cdot \vec{F} dv = \int_0^a \int_0^a \int_0^a (3y^2 + 3x^2 + 3z^2) dx dy dz = 3a^5$ (4M) <ul style="list-style-type: none"> <li>• <math>\iint_S \vec{F} \cdot \hat{n} ds = a^5 + 0 + a^5 + 0 + a^5 + 0 = 3a^5</math> (8M)</li> </ul>
15.	<p><b>Verify Gauss Divergence theorem for</b> <math>\vec{F} = 4xz \vec{i} - y^2 \vec{j} + zy \vec{k}</math> over the region bounded by <math>x = 0, x = 1, y = 0, y = 1, z = 0, z = 1</math> (May/June 2012 R-08) (16 M) BTL3</p> <p><b>Answer :</b> Refer Page No.2.109-Dr.M.CHANDRASEKAR</p> <ul style="list-style-type: none"> <li>• <math>\iint_S \vec{F} \cdot \hat{n} ds = \iiint_V \nabla \cdot \vec{F} dv</math> (2M)</li> </ul>

	<ul style="list-style-type: none"> <li>• <math>\nabla \cdot \vec{F} = 4z - y</math> (2M)</li> <li>• <math>\iiint_V \nabla \cdot \vec{F} dv = \int_0^1 \int_0^1 \int_0^1 (4z - y) dx dy dz = \frac{3}{2}</math> (4M)</li> <li>• <math>\iint_S \vec{F} \cdot \hat{n} ds = 2 + 0 - 1 + 0 + \frac{1}{2} + 0 = \frac{3}{2}</math> (8M)</li> </ul>
	<p><b>Verify Gauss Divergence theorem for <math>\vec{F} = y\vec{i} + x\vec{j} + z^2\vec{k}</math> over the cylindrical region bounded by <math>x^2 + y^2 = 9, z = 0</math> and <math>z = 2</math> (Dec/Jan 2015 R-13) (16 M)BTL3</b></p> <p><b>Answer : Refer Page No.2.103-Dr.M.CHANDRASEKAR</b></p>
16.	<ul style="list-style-type: none"> <li>• <math>\iint_S \vec{F} \cdot \hat{n} ds = \iiint_V \nabla \cdot \vec{F} dv</math> (2M)</li> <li>• <math>\nabla \cdot \vec{F} = 2z</math> (2M)</li> <li>• <math>\iiint_V \nabla \cdot \vec{F} dv = \int_{-3}^3 \int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}} \int_0^2 2z dx dy dz = 36\pi</math> (4M)</li> <li>• <math>\iint_S \vec{F} \cdot \hat{n} ds = 0 + 36\pi + 0 = 36\pi</math> (8M)</li> </ul>
	<p><b>Verify Stokes theorem for <math>\vec{F} = (x^2 + y^2)\vec{i} - 2xy\vec{j}</math> taken around the rectangle bounded by <math>x = \pm a, y = 0, y = b</math> (May/June 2004) (16 M)BTL3</b></p> <p><b>Answer : Refer Page No.2.122-Dr.M.CHANDRASEKAR</b></p>
17.	<ul style="list-style-type: none"> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = \iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds</math> (2M)</li> <li>• <math>\nabla \times \vec{F} = \begin{vmatrix} \vec{i} &amp; \vec{j} &amp; \vec{k} \\ \partial/\partial x &amp; \partial/\partial y &amp; \partial/\partial z \\ (x^2 + y^2) &amp; -2xy &amp; 0 \end{vmatrix} = -4y\vec{k}</math> (2M)</li> <li>• <math>\iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds = \int_0^b \int_{-a}^a (-4y) dx dy = -4ab^2</math> (4M)</li> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = AB + BC + CD + DA = \left( \frac{2a^3}{3} \right) - (ab^2) - \left( 2ab^2 + \frac{2a^3}{3} \right) - (ab^2) = -4ab^2</math> (8 M)</li> </ul>
18.	<p><b>Verify Stokes theorem for <math>\vec{F} = (x^2 - y^2)\vec{i} + 2xy\vec{j}</math> taken around the rectangle bounded by <math>x = 0, x = a, y = 0, y = b</math> (May/June 2004) (16 M)BTL3</b></p> <p><b>Answer : Refer Page No.2.124-Dr.M.CHANDRASEKAR</b></p>

	<ul style="list-style-type: none"> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = \iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds</math> (2M)</li> <li>• <math>\nabla \times \vec{F} = \begin{vmatrix} \vec{i} &amp; \vec{j} &amp; \vec{k} \\ \partial/\partial x &amp; \partial/\partial y &amp; \partial/\partial z \\ (x^2 - y^2) &amp; 2xy &amp; 0 \end{vmatrix} = 4y\vec{k}</math> (2M)</li> <li>• <math>\iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds = \int_0^b \int_0^a (4y) dx dy = 2ab^2</math> (4M)</li> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = OA + AB + BC + CO = \left(\frac{a^3}{3}\right) + (ab^2) + \left(ab^2 - \frac{a^3}{3}\right) + (0) = 2ab^2</math> (8 M)</li> </ul>
	<p><b>Verify Stokes theorem for <math>\vec{F} = x^2\vec{i} + xy\vec{j}</math> integrated around the square in <math>z=0</math> plane whose sides are along the lines <math>x = 0, x = a, y = 0, y = a</math> (May/June 2008) (16 M) BTL3</b></p> <p><b>Answer : Refer Page No.2.126-Dr.M.CHANDRASEKAR</b></p>
19.	<ul style="list-style-type: none"> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = \iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds</math> (2M)</li> <li>• <math>\nabla \times \vec{F} = \begin{vmatrix} \vec{i} &amp; \vec{j} &amp; \vec{k} \\ \partial/\partial x &amp; \partial/\partial y &amp; \partial/\partial z \\ x^2 &amp; xy &amp; 0 \end{vmatrix} = y\vec{k}</math> (2M)</li> <li>• <math>\iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds = \int_0^a \int_0^a (y) dx dy = \frac{a^3}{2}</math> (4M)</li> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = OA + AB + BC + CO = \left(\frac{a^3}{3}\right) + \left(\frac{a^3}{2}\right) + \left(-\frac{a^3}{3}\right) = \left(\frac{a^3}{2}\right)</math> (8 M)</li> </ul>
20.	<p><b>Verify Stokes theorem for <math>\vec{F} = (y - z + 2)\vec{i} + (yz + 4)\vec{j} - xz\vec{k}</math> where S is the open surface of the cube <math>x = 0, x = 2, y = 0, y = 2, z = 0, z = 2</math> above the xy-plane (May/June 2005) (May/June-2018 R-17)(16 M) BTL3</b></p> <p><b>Answer : Refer Page No.2.132-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = \iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds</math> (2M)</li> <li>• <math>\nabla \times \vec{F} = \begin{vmatrix} \vec{i} &amp; \vec{j} &amp; \vec{k} \\ \partial/\partial x &amp; \partial/\partial y &amp; \partial/\partial z \\ y - z + 2 &amp; yz + 4 &amp; -xz \end{vmatrix} = -y\vec{i} + (z - 1)\vec{j} - \vec{k}</math> (2M)</li> </ul>

	<ul style="list-style-type: none"> <li>• <math>\iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds = (-4) + (4) + (4) + (-4) + (-4) = -4 \text{ (4M)}</math></li> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = OA + AC + CB + BO = (4) + (8) + (-8) + (-8) = (-4) \text{ (8 M)}</math></li> </ul>
	<p><b>Using Stokes theorem to Evaluate <math>\int_C \vec{F} \cdot d\vec{r}</math> where <math>\vec{F} = (y^2)\vec{i} + (x^2)\vec{j} - (x+z)\vec{k}</math></b></p> <p><b>and C is the boundary of the triangle with vertices (0,0,0), (1,0,0) and (1,1,0)</b></p> <p><b>(8 M)BTL3</b></p> <p><b>Answer : Refer Page No.2.137-Dr.M.CHANDRASEKAR</b></p>
21.	<ul style="list-style-type: none"> <li>• <math>\int_C \vec{F} \cdot d\vec{r} = \iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds \text{ (2M)}</math></li> <li>• <math>\nabla \times \vec{F} = \begin{vmatrix} \vec{i} &amp; \vec{j} &amp; \vec{k} \\ \partial/\partial x &amp; \partial/\partial y &amp; \partial/\partial z \\ y^2 &amp; x^2 &amp; -(x+z) \end{vmatrix} = \vec{j} + 2(x-y)\vec{k} \text{ (2M)}</math></li> <li>• <math>\iint_S (\nabla \times \vec{F}) \cdot \hat{n} ds = \int_0^1 \int_0^x 2(x-y) dy dx = \frac{1}{3} \text{ (4M)}</math></li> </ul>
	<b>UNIT-III ANALYTIC FUNCTIONS</b>
	Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by $w = z + c, cz, \frac{1}{z}, z^2$ – Bilinear transformation
	<b>PART-A</b>
1.	<p><b>Show that the function <math>f(z) = \bar{z}</math> is no where differentiable. (DEC/JAN-2013) (NOV/DEC-2015)BTL2</b></p> <p>Given</p> $w = f(z) = \bar{z}$ $\therefore u + iv = x - iy \Rightarrow u = x, v = -y$ $u_x = 1, v_x = 0$ $u_y = 0, v_y = -1$ $\therefore u_x \neq v_y$ <p>So C-R equations are not satisfied for any x and y.  <math>\therefore f(z)</math> is not differentiable anywhere.Hence not analytic anywhere.</p>
2	<b>Test the analyticity of the function <math>w = \sin z</math>.BTL4</b>

	<p>Given <math>w = \sin z</math>  <math>u + iy = \sin(x + iy)</math>  <math>= \sin x \cos iy + \cos x \sin(iy)</math>  <math>= \sin x \cosh y + i \cos x \sinh y</math>  <math>\Rightarrow u = \sin x \cosh y; v = \cos x \sinh y</math>  <math>\therefore u_x = \cos x \cosh y; v_x = -\sin x \sinh y</math>  <math>u_y = \sin x \sinh y; v_y = \cos x \cosh y</math>  <math>\therefore u_x = v_y, u_y = -v_x</math></p> <p>So C-R equations are satisfied for all x and y and <math>u_x, u_y, v_x, v_y</math> are continuous <math>\therefore f(z)</math> is analytic everywhere.</p>
3	<p><b>Find the constants a,b,c if <math>f(z) = x + ay + i(bx + cy)</math> is analytic. (DEC/JAN-2014) BTL1</b></p> <p>Let <math>u + iv = f(z)</math>  Since <math>f(z)</math> is analytic, u and v satisfy the C-R Equations.</p> $u_x = v_y, \quad u_y = -v_x$ <p>here <math>u = x + ay, v = bx + cy</math></p> $u_x = 1, \quad v_x = b$ $u_y = a, \quad v_y = c$ $\therefore u_x = v_y \Rightarrow c = 1;$ $u_y = -v_x \Rightarrow a = -b$
4	<p><b>Show that <math>u = 2x - x^3 + 3xy^2</math> is harmonic BTL2</b></p> <p>Given</p> $u = 2x - x^3 + 3xy^2$ $u_x = 2 - 3x^2 + 3y^2; u_y = 6xy$ $u_{xx} = -6x; \quad u_{yy} = 6x$ $\therefore u_{xx} + u_{yy} = -6x + 6x = 0.$ <p>Therefore u is harmonic</p>
5	<p><b>Show that the function <math>u = y + e^x \cos y</math> is harmonic. BTL2</b></p> <p>Given</p> $u = y + e^x \cos y$ $u_x = e^x \cos y, \quad u_y = 1 + e^x(-\sin y)$ $u_{xx} = e^x \cos y, \quad u_{yy} = -e^x \cos y$ $u_{xx} + u_{yy} = e^x \cos y - e^x \cos y = 0$ <p>Therefore u is harmonic</p>
6	<p><b>Show that <math>x^2 + iy^3</math> is not analytic anywhere. BTL2</b></p>

	<p>Let</p> $u + iv = x^2 + iy^3$ $\therefore u = x^2, \quad v = y^3$ $u_x = 2x, \quad v_x = 0$ $u_y = 0, \quad v_y = 3y^2$ $\therefore u_x \neq v_y, \quad u_y = -v_x$ <p><math>\therefore</math> The function is not analytic.</p> <p>But, when <math>x = 0, y = 0</math> the C-R Equations are satisfied.</p>
7	<p><b>For the conformal mapping <math>f(z) = z^2</math>, find the scale factor at <math>z = i</math>.</b> BTL1 Given</p> $f(z) = z^2,$ $\therefore f'(z) = 2z$ <p>Scale factor at <math>z = i</math> is <math> f'(i)  =  2i  = 2</math></p>
8	<p><b>Find the image of <math>x = 2</math> under the transformation <math>w = \frac{1}{z}</math>.</b> BTL1</p> <p>Given <math>w = \frac{1}{z} \Rightarrow z = \frac{1}{w} = \frac{\bar{w}}{w\bar{w}}</math></p> $\Rightarrow x + iy = \frac{u - iv}{u^2 + v^2}$ $\therefore x = \frac{u}{u^2 + v^2}$ <p><math>\therefore</math> The image of <math>x = 2</math> is <math>\frac{u}{u^2 + v^2} = 2 \Rightarrow u^2 + v^2 - \frac{u}{2} = 0</math> which is a circle in the <math>w</math>-plane.</p>
9	<p><b>Find the image of <math>x = k</math> under the transformation <math>w = \frac{1}{z}</math>.</b> BTL1</p> <p>Given <math>w = \frac{1}{z} \Rightarrow z = \frac{1}{w} = \frac{\bar{w}}{w\bar{w}}</math></p> $\Rightarrow x + iy = \frac{u - iv}{u^2 + v^2}$ $\therefore x = \frac{u}{u^2 + v^2}$ <p><math>\therefore</math> The image of <math>x = k</math> is <math>\frac{u}{u^2 + v^2} = k \Rightarrow u^2 + v^2 - \frac{u}{k} = 0</math> which is a circle in the <math>w</math>-plane</p>
10	<p><b>Find the image of the circle <math> z  = 2</math> under the transformation <math>w = 3z</math>.</b> (NOV/DEC-2014)</p> <p>BTL1</p> <p>Given <math>w = 3z</math></p> $ w  = 3 z $ $= 3 \times 2$ $= 6$

	<p><math>\therefore</math> The image of the circle <math> z =2</math> is the circle <math> w =6</math> in the w-plane.</p> $\therefore \sqrt{u^2 + v^2} = 6,$ $\Rightarrow u^2 + v^2 = 36, \text{ which is a circle}$
11	<p><b>Find the image of the circle <math> z =2</math> under the transformation <math>w=z+3+2i</math>.</b> BTL1</p> <p>Given <math>w = z + 3 + 2i</math></p> $u + iv = x + iy + 3 + 2i$ $\therefore u = x + 3 \Rightarrow x = u - 3$ $v = y + 2 \Rightarrow y = v - 2$ $ z =2 \Rightarrow \sqrt{x^2 + y^2} = 2$ $\Rightarrow x^2 + y^2 = 4$ $\Rightarrow (u - 3)^2 + (v - 2)^2 = 4$
12	<p><b>Find the image of the line <math>x - y + 1 = 0</math> under the map <math>w = \frac{1}{z}</math>.</b> BTL1</p> <p>Given <math>w = \frac{1}{z} \Rightarrow z = \frac{1}{w} = \frac{\bar{w}}{w\bar{w}}</math></p> $\Rightarrow x + iy = \frac{u - iv}{u^2 + v^2}$ $\therefore x = \frac{u}{u^2 + v^2}, y = \frac{-v}{u^2 + v^2}$ <p>The image of the line <math>x - y + 1 = 0</math> is</p> $\frac{u}{u^2 + v^2} + \frac{-v}{u^2 + v^2} + 1 = 0$ $\Rightarrow u^2 + v^2 + u - v = 0 \text{ which is a circle in the w-plane}$
13	<p><b>Find the fixed points of the transformation <math>w = \frac{6z-9}{z}</math>.</b> BTL1</p> <p>The given transformation <math>w = \frac{6z-9}{z}</math>.</p> <p>The fixed points are given by</p> $w = z$ $\Rightarrow z = \frac{6z-9}{z}$ $\Rightarrow z^2 = 6z - 9$ $\Rightarrow z^2 - 6z + 9 = 0$ $\Rightarrow (z-3)^2 = 0$ $\Rightarrow z = 3, 3$
14	<p><b>Find the fixed points of the mapping <math>w = \frac{3-z}{1+z}</math>.</b> BTL1</p> <p>The given map <math>w = \frac{3-z}{1+z}</math></p> <p>The fixed points are given by <math>w = z</math></p>



	$1 = b$ and $2a = -3$ $\Rightarrow a = -\frac{3}{2}$ and $b = -1$
20	<b>State the Cauchy Riemann equations in polar coordinates satisfied by an analytic Function.</b> BTL1 Cauchy Riemann equations in polar coordinates are given by $u_r = \frac{1}{r}v_\theta$ and $v_r = -\frac{1}{r}u_\theta$ where u and v are functions of $r$ and $\theta$ .
21	<b>Find the critical points of the transformation</b> $w = 1 + \frac{2}{z}$ . (NOV/DEC-2016) BTL1 The critical points of the transformation are obtained by $f'(z) = 2z$ Hence $-\frac{2}{z^2} = 0$ $\Rightarrow -\frac{2}{0} = z^2$ $\Rightarrow z = \infty$ is the critical point of the given transformation.
22	<b>Find the image of the region</b> $x > c$ , where $c > 0$ under the transformation $w = \frac{1}{z}$ . BTL1 $w = \frac{1}{z} \Rightarrow z = \frac{1}{w}$ Let $z = x + iy$ and $w = u + iv$ $x + iy = \frac{1}{u + iv} = \frac{u - iv}{(u + iv)(u - iv)} = \frac{u - iv}{u^2 + v^2}$ $\therefore x = \frac{u}{u^2 + v^2}$ and $y = \frac{-v}{u^2 + v^2}$ $x > c \Rightarrow x = \frac{u}{u^2 + v^2} > c$ $u > cu^2 + cv^2$ $u^2 + v^2 < \frac{u}{c}$ $u^2 + v^2 - \frac{u}{c} < 0$ . This refers to the inside of the circle center $(\frac{1}{2c}, 0)$ and radius $\frac{1}{2c}$ .
23	<b>Show that an analytic function with constant real part is constant.</b> BTL2 Let $f(z) = u + iv$ be analytic. $\Rightarrow u_x = v_y$ and $u_y = -v_x$ Given that $u = \text{constant.} = c$ (say). $\Rightarrow u_x = 0$ and $v_y = 0 \Rightarrow u_y = 0$ and $-v_x = 0$ $\Rightarrow v$ is independent of $x$ and $y$ . $\Rightarrow v$ is constant $\Rightarrow f(z) = u + iv = c + ic$ is a constant.
24	<b>Find the critical points of the transformation</b> $w^2 = (z - \alpha)(z - \beta)$ . (DEC/JAN-2010) (NOV/DEC-2016) BTL1 Let $w^2 = (z - \alpha)(z - \beta)$ . Then, $2w \frac{dw}{dz} = (z - \alpha) \cdot 1 + (z - \beta) \cdot 1$ The Critical points of $w = f(z)$ is given by, $\frac{dw}{dz} = 0 \Rightarrow (z - \alpha) \cdot 1 + (z - \beta) \cdot 1 = 0 \Rightarrow z = \frac{\alpha + \beta}{2}$ .



If  $f(z)$  is an analytic function, Prove that  $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$

(NOV/DEC 2014) (8 M)BTL5

Answer : Refer Page No.3.31-Dr.M.CHANDRASEKAR

1. • C-R Equations are  $u_x = v_y$ ,  $u_y = -v_x$  (2M)

$$\bullet \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 2 \left[ \left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial v}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2 + \left(\frac{\partial v}{\partial y}\right)^2 \right] \quad (4M)$$

$$\bullet \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4 \left[ \left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial v}{\partial x}\right)^2 \right] = 4|f'(z)|^2 \quad (2M)$$

If  $f(z) = u + iv$  is analytic, Prove that  $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\log|f(z)| = 0$ .(MAY/JUNE 2002)

(8M)BTL5

Answer : Refer Page No.3.33-Dr.M.CHANDRASEKAR

2. • C-R Equations are  $u_x = v_y$ ,  $u_y = -v_x$  (2M)

$$(u^2 + v^2)[u_x^2 + v_x^2 + u_y^2 + v_y^2 + u(u_{xx} + u_{yy})]$$

$$\bullet \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\log|f(z)| = \frac{+v(v_{xx} + v_{yy}) - 2[(uu_x + vv_x)^2 + (uu_y + vv_y)^2]}{(u^2 + v^2)^2} \quad (4M)$$

Since the function  $f(z)$  is analytic, it satisfies C-R equations and hence

- the function is harmonic. (2 M)

$$\therefore \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\log|f(z)| = 0$$

Prove that  $u = x^2 - y^2$ ,  $v = \frac{-y}{x^2 + y^2}$  are harmonic but  $u + iv$  is not regular function.

(NOV/DEC 2013) (8 M)BTL5

Answer : Refer Page No.3.44-Dr.M.CHANDRASEKAR

3. • For Proving  $u$  is harmonic  $u_{xx} + u_{yy} = 2 - 2 = 0$  (2M)

$$\bullet \text{For Proving } v \text{ is harmonic } v_{xx} + v_{yy} = \left(\frac{2y^3 - 6x^2y}{(x^2 + y^2)^3}\right) + \left(-\frac{(2y^3 - 6x^2y)}{(x^2 + y^2)^3}\right) = 0 \quad (2M)$$

- But  $u_x \neq v_y$ ,  $u_y \neq -v_x \Rightarrow f(z) = u + iv$  is not a regular function . (2 M)

4. If  $f(z) = u + iv$  is analytic, Prove that  $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|u|^p = p(p-1)(u^{p-2})|f'(z)|^2$

	<p><b>(MAY/JUNE 2002) (MAY/JUNE 2018 R-17) (8 M) BTL5</b>  <b>Answer : Refer Page No.3.36-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• C-R Equations are <math>u_x = v_y</math>, <math>u_y = -v_x</math> (2M)</li> <li>• <math>\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right)  u ^p = pu^{p-1} \left( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) + (p-1)pu^{p-2} \left( \left( \frac{\partial u}{\partial x} \right)^2 + \left( \frac{\partial u}{\partial y} \right)^2 \right)</math> (4M)</li> <li>• <math>\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right)  u ^p = p(p-1)(u^{p-2})  f'(z) ^2</math> (2M)</li> </ul>
	<p>In a two dimensional flow, the stream function is <math>\psi = \tan^{-1} \left( \frac{y}{x} \right)</math> Find the velocityPotential <math>\phi</math>. (NOV/DEC 2016) (8 M) BTL1  <b>Answer : Refer Page No.3.50-Dr.M.CHANDRASEKAR</b></p>
5.	<ul style="list-style-type: none"> <li>• <math>\frac{\partial \psi}{\partial x} = \frac{-y}{x^2 + y^2}</math>; <math>\frac{\partial \psi}{\partial y} = \frac{x}{x^2 + y^2}</math> (2M)</li> <li>• <math>\phi = \int \left( \frac{\partial \psi}{\partial y} dx - \frac{\partial \psi}{\partial x} dy \right)</math> (2 M)</li> <li>• <math>\phi = \log(x^2 + y^2) + c</math> (4M)</li> </ul>
6.	<p>Show that the function <math>u = \frac{1}{2} \log(x^2 + y^2)</math> is harmonic and find its harmonic conjugate (NOV/DEC 2016) (8 M) BTL2  <b>Answer : Refer Page No.3.52-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>\frac{\partial u}{\partial x} = \frac{x}{x^2 + y^2}</math>; <math>\frac{\partial u}{\partial y} = \frac{y}{x^2 + y^2}</math> (2M)</li> <li>• For Proving u is harmonic <math>u_{xx} + u_{yy} = \left( \frac{y^2 - x^2}{(x^2 + y^2)^2} \right) + \left( -\frac{y^2 - x^2}{(x^2 + y^2)^2} \right) = 0</math> (2 M)</li> <li>• <math>v = \tan^{-1} \left( \frac{y}{x} \right) + c</math> (4M)</li> </ul>
7.	<p>Prove that <math>e^x[x \cos y - y \sin y]</math> can be the real part of an analytic function and determine its harmonic conjugate (NOV/DEC 2013) (8 M)  <b>Answer : Refer Page No.3.55-Dr.M.CHANDRASEKAR</b></p> <p style="text-align: right;">BTL5</p> <ul style="list-style-type: none"> <li>• <math>\frac{\partial u}{\partial x} = e^x x \cos y + e^x \cos y - e^x y \sin y</math>  <math>\frac{\partial u}{\partial y} = -e^x x \sin y - e^x y \cos y - e^x \sin y</math> (2M)</li> </ul>

	<p>For Proving u is harmonic</p> <ul style="list-style-type: none"> <li><math>u_{xx} + u_{yy} = (e^x x \cos y + 2e^x \cos y - e^x y \sin y) + (-e^x x \cos y - 2e^x \cos y + e^x y \sin y) = 0</math></li> </ul> <p style="text-align: center;"><b>(2 M)</b></p> <ul style="list-style-type: none"> <li><math>v = e^x x \sin y + e^x y \cos y + c</math> <span style="float: right;"><b>(4M)</b></span></li> </ul>
	<p><b>Find an analytic function <math>f(z) = u + iv</math> whose real part is <math>e^x[x \cos y - y \sin y]</math> (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.64-Dr.M.CHANDRASEKAR</b></p>
8.	$\frac{\partial u}{\partial x} = e^x x \cos y + e^x \cos y - e^x y \sin y$ <ul style="list-style-type: none"> <li><math>\frac{\partial u}{\partial y} = -e^x x \sin y - e^x y \cos y - e^x \sin y</math> <span style="float: right;"><b>(2M)</b></span></li> </ul> $\frac{\partial u}{\partial x}(z, 0) = e^z + ze^z$ <ul style="list-style-type: none"> <li><math>\frac{\partial u}{\partial y}(z, 0) = 0</math> <span style="float: right;"><b>(2 M)</b></span></li> </ul> $f(z) = ze^z + c$ <span style="float: right;"><b>(4M)</b></span>
9.	<p><b>Find an analytic function <math>f(z) = u + iv</math> whose real part is <math>e^{2x}[x \cos 2y - y \sin 2y]</math> (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.66-Dr.M.CHANDRASEKAR</b></p>
10.	<p><b>Find an analytic function <math>f(z) = u + iv</math> if <math>u - v = e^x[\cos y - \sin y]</math> (MAY/JUNE 2018 R-17)(8 M)BTL1</b></p> <p><b>Answer : Refer Page No.3.76-Dr.M.CHANDRASEKAR</b></p>

	<ul style="list-style-type: none"> <li><math>\frac{\partial U}{\partial x} = e^x \cos y - e^x \sin y</math></li> <li><math>\frac{\partial U}{\partial y} = -e^x \cos y - e^x \sin y</math> (2M)</li> <li><math>\frac{\partial U}{\partial x}(z, 0) = e^z</math></li> <li><math>\frac{\partial V}{\partial y}(z, 0) = -e^z</math> (2 M)</li> <li><math>F(z) = (1+i)f(z)</math> (4M)</li> <li><math>f(z) = e^z + c</math></li> </ul>
	<p><b>Prove that the function <math>v = e^{-x}[x \cos y + y \sin y]</math> is harmonic and determine the corresponding analytic function <math>f(z) = u + iv</math> (8 M) BTL5</b></p> <p><b>Answer : Refer Page No.3.69-Dr.M.CHANDRASEKAR</b></p>
11.	<ul style="list-style-type: none"> <li><math>\frac{\partial v}{\partial x} = -e^{-x}x \cos y + e^{-x} \cos y - e^{-x}y \sin y</math></li> <li><math>\frac{\partial v}{\partial y} = -e^{-x}x \sin y + e^{-x}y \cos y + e^{-x} \sin y</math> (2M)</li> </ul> <p>For Proving u is harmonic</p> <ul style="list-style-type: none"> <li><math>v_{xx} + v_{yy} = (e^{-x}[(x-2)\cos y + y \sin y]) + (e^{-x}[(2-x)\cos y - y \sin y]) = 0</math> (2 M)</li> <li><math>\frac{\partial v}{\partial x}(z, 0) = e^{-z}(1-z)</math></li> <li><math>\frac{\partial v}{\partial y}(z, 0) = 0</math> (2 M)</li> <li><math>f(z) = iz e^{-z} + c</math> (2M)</li> </ul>
12.	<p>Given that <math>u = \frac{\sin 2x}{\cosh 2y - \cos 2x}</math> find the analytic function whose real part is u.</p> <p>(NOV/DEC 2014)(MAY/JUNE 2006) (8 M) BTL1</p> <p><b>Answer : Refer Page No.3.71-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math>\frac{\partial u}{\partial x}(z, 0) = -\operatorname{cosec}^2 z</math></li> <li><math>\frac{\partial u}{\partial y}(z, 0) = 0</math> (4M)</li> <li><math>f(z) = \cot z + c</math> (4M)</li> </ul>
13.	<p>If <math>f(z) = u + iv</math> is analytic, find <math>f(z)</math> given that <math>u + v = \frac{\sin 2x}{\cosh 2y - \cos 2x}</math></p> <p>(NOV/DEC 2015) (8 M) BTL1</p>

	<b>Answer : Refer Page No.3.74-Dr.M.CHANDRASEKAR</b>
	<ul style="list-style-type: none"> <li>• <math>\frac{\partial V}{\partial x}(z,0) = -\operatorname{cosec}^2 z</math> <b>(4M)</b></li> <li>• <math>\frac{\partial V}{\partial y}(z,0) = 0</math></li> <li>• <math>f(z) = \left(\frac{1+i}{2}\right)\cot z + c</math> <b>(4M)</b></li> </ul>
14.	<p><b>Find the image of <math> z-3 =3</math> under the mapping <math>w=\frac{1}{z}</math></b>  <b>(NOV/DEC 2010) (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.108-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>x = \frac{u}{u^2 + v^2}</math> &amp; <math>y = \frac{-v}{u^2 + v^2}</math> <b>(4M)</b></li> <li>• The image of the circle <math> z-3 =3</math> is the straight line <math>u = \frac{1}{6}</math> <b>(4M)</b></li> </ul>
15.	<p><b>Find the image of <math> z+i =1</math> under the mapping <math>w=\frac{1}{z}</math></b>  <b>(NOV/DEC 2013) (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.109-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>x = \frac{u}{u^2 + v^2}</math> &amp; <math>y = \frac{-v}{u^2 + v^2}</math> <b>(4M)</b></li> <li>• The image of the circle <math> z+i =1</math> is the straight line <math>v = \frac{1}{2}</math> <b>(4M)</b></li> </ul>
16.	<p><b>Find the image of <math>1 &lt; y &lt; 2</math> under the mapping <math>w=\frac{1}{z}</math></b>  <b>(MAY/JUNE 2014) (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.110-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>x = \frac{u}{u^2 + v^2}</math> &amp; <math>y = \frac{-v}{u^2 + v^2}</math> <b>(4M)</b></li> <li>• <math>1 &lt; y &lt; 2</math> is mapped onto the region between the circles <math>u^2 + v^2 + v = 0</math> and <math>2(u^2 + v^2) + v = 0</math> <b>(4M)</b></li> </ul>
17.	<p><b>Find the image of <math> z-2i =2</math> under the mapping <math>w=\frac{1}{z}</math></b>  <b>(NOV/DEC 2007) (MAY/JUNE 2018 R-17) (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.112-Dr.M.CHANDRASEKAR</b></p>

	<ul style="list-style-type: none"> <li><math>x = \frac{u}{u^2 + v^2}</math> &amp; <math>y = \frac{-v}{u^2 + v^2}</math> (4M)</li> <li>The image of the circle <math> z - 2i  = 2</math> is the straight line <math>v = -\frac{1}{4}</math> (4M)</li> </ul>
18.	<p><b>Find the bilinear transformation which maps <math>-1, -i, 1</math> in the z-plane <math>\infty, i, 0</math> in the w-plane respectively. (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.132-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math display="block">\frac{(w-w_1)(w_2-w_3)}{(w-w_3)(w_2-w_1)} = \frac{(z-z_1)(z_2-z_3)}{(z-z_3)(z_2-z_1)}</math> (2M)</li> <li><math display="block">w = \frac{(1-z)}{(1+z)}</math> (6M)</li> </ul>
19.	<p><b>Find the bilinear transformation which maps <math>\infty, i, 0</math> onto <math>0, i, \infty</math> respectively. (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.133-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math display="block">\frac{(w-w_1)(w_2-w_3)}{(w-w_3)(w_2-w_1)} = \frac{(z-z_1)(z_2-z_3)}{(z-z_3)(z_2-z_1)}</math> (2M)</li> <li><math display="block">w = \frac{-1}{z}</math> (6M)</li> </ul>
20.	<p><b>Find the bilinear transformation which maps <math>z = 1, 0, -1</math> onto <math>w = \infty, -1, 0</math> respectively. (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.133-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math display="block">\frac{(w-w_1)(w_2-w_3)}{(w-w_3)(w_2-w_1)} = \frac{(z-z_1)(z_2-z_3)}{(z-z_3)(z_2-z_1)}</math> (2M)</li> <li><math display="block">w = \frac{z+1}{z-1}</math> (6M)</li> </ul>
21.	<p><b>Find the bilinear transformation which maps <math>-1, 0, 1</math> onto <math>-1, -i, 1</math> respectively. Show that under this transformation the upper half of the z-plane maps onto the interior of the unit circle <math> w =1</math> (MAY/JUNE 2018 R-17) (8 M) BTL1</b></p> <p><b>Answer : Refer Page No.3.134-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math display="block">\frac{(w-w_1)(w_2-w_3)}{(w-w_3)(w_2-w_1)} = \frac{(z-z_1)(z_2-z_3)}{(z-z_3)(z_2-z_1)}</math> (2M)</li> <li><math display="block">w = \frac{1-iz}{z-i}</math> (2M)</li> <li><math display="block">x = \frac{2u}{u^2 + (v-1)^2}</math> &amp; <math>y = \frac{-(u^2 + v^2 - 1)}{u^2 + (v-1)^2}</math> (2M)</li> <li>For proving the upper half of the z-plane maps onto the interior of the unit circle</li> </ul>

	$ w  \leq 1$ (2M)
<b>UNIT IV- COMPLEX INTEGRATION</b>	
	Line integral – Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s and Laurent’s series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.
<b>Q.No.</b>	<b>PART-A</b>
1	<b>State Cauchy integral theorem. (NOV/DEC 2014)(MAY/JUNE 2016)</b> BTL1 If a function $f(z)$ is analytic and its derivative $f'(z)$ is continuous at all points inside and on a simple closed curve $C$ , then $\int_C f(z) dz = 0$ .
2	<b>State Cauchy integral formula.</b> BTL1  If $f(z)$ is analytic inside and on a simple closed curve $C$ in the region $R$ and if ‘a’ is any point in $R$ then $\int_C \frac{f(z)}{z-a} dz = 2\pi i f(a)$ where the integration around $C$ taken in the positive direction.
3	<b>State Cauchy integral formula for derivatives. (NOV/DEC 2010)</b> BTL1 If a function $f(z)$ is analytic within and on a simple closed curve $c$ and ‘a’ is any point lying in it, then $\int_c \frac{f(z)}{(z-a)^{n+1}} dz = \begin{cases} \frac{2\pi i}{n!} f^{(n)}(a) & ; a \text{ lies inside } c \\ 0 & ; a \text{ lies outside } c \end{cases}$
4	<b>State Cauchy Residue Theorem (NOV/DEC 2012)</b> BTL1 If $f(z)$ is analytic at all points inside and on a simple closed curve $C$ except at a Finite number of points $z_1, z_2, z_3, \dots, z_n$ inside $C$ then $\int_C f(z) dz = 2\pi i [\text{sum of residues of } f(z)]$
5	<b>Evaluate</b> $\int_C \frac{dz}{z-2}$ <b>where C is the square with vertices (0,0), (1,0), (1,1), (0,1).</b> BTL5  Given $C$ is the square with vertices $(0,0), (1,0), (1,1), (0,1)$ . ie) $x=1, y=1$ . Since $\int_C \frac{dz}{z-2}$ . Equating the denominator to zero. $z-2=0 \Rightarrow z=2$ . Which lies outside $C$ .
6	<b>Evaluate</b> $\int_C \frac{3z^2 + 7z + 1}{z-3} dz$ <b>where C is</b> $ z =2$ . BTL5  Given $ z =2$ that is, $x^2 + y^2 = 2^2$ with center $(0,0)$ and radius 2.  Given $\int_C \frac{3z^2 + 7z + 1}{z-3} dz$ . Equating the denominator to zero. $(z-3)^2 = 0 \Rightarrow z=3$ which lies outside $C$ .  $\therefore \text{By Cauchy's integral formula } \int_C \frac{3z^2 + 7z + 1}{z-3} dz = 0.$

7	<p><b>Evaluate</b> <math>\int_C \frac{\cos \pi z}{z-1} dz</math> <b>where C is</b> <math> z =2</math>(NOV/DEC 2015)BTL5</p> <p>Given <math> z =2</math> that is, <math>x^2 + y^2 = 2^2</math> with center (0,0) and radius 2.</p> <p>Given <math>\int_C \tan z dz = \int_C \frac{\sin z}{\cos z} dz</math>. Equating the denominator to zero.</p> <p><math>\cos z = 0 = \cos \frac{\pi}{2} \Rightarrow z = \frac{\pi}{2} = 1.732</math>. Which lies inside C.</p> <p><math>\therefore</math> By Cauchy's integral formula <math>\int_C \frac{dz}{z-a} = 2\pi i f(a)</math>.</p> <p>Here <math>a=\frac{\pi}{2}, f(z)=\sin z \Rightarrow f(a)=f(\frac{\pi}{2})=\sin \frac{\pi}{2}=1</math>.</p> <p><math>\therefore \int_C \tan z dz = 2\pi i(1) = 2\pi i</math></p>
8	<p><b>Evaluate the integral</b> <math>\int_C (z^2 + 2z) dz</math> <b>where C is</b> <math> z =1</math>.BTL5</p> <p>Given <math> z =1</math>. that is, <math>x^2 + y^2 = 1</math> with centre (0,0)and radius 1.</p> <p><math>f(z)=z^2 + 2z</math> is a function which is analytic in the region bounded by C</p> <p>Hence by Cauchy's theorem <math>\int_C (z^2 + 2z) dz = 0</math>.</p>
9	<p><b>Find the contour C:</b> <math> z &lt;1</math>for which <math>\int_C \frac{e^z}{(z+1)^2(z+1)} dz = 0</math>.BTL1 <math>\int_C \frac{e^z}{(z+1)^2(z+1)} dz = 0</math></p> <p>when <math> z &lt;1</math>.</p> <p>[since the points lies outside the contour, then the integral value is 0.]</p>
10	<p><b>Evaluate</b> <math>\int_C \frac{dz}{(z-3)^2}</math> <b>where C is</b> <math> z =1</math>BTL5</p> <p>Given <math> z =1</math>. that is, <math>x^2 + y^2 = 1</math> with center (0,0) and radius 1.</p> <p><math>\int_C \frac{dz}{(z-3)^2}</math>. Equating the denominator to zero. <math>(z-3)^2=0 \Rightarrow z=3</math> which lies outside C.</p>

	<p>∴ By Cauchy's integral formula for derivatives <math>\int\limits_C \frac{dz}{(z-3)^2} = 0</math>.</p>
12	<p>Evaluate <math>\int\limits_c \frac{e^z dz}{z-2}</math>, where C is the unit circle with centre as origin.BTL5  <b>(MAY/JUNE 2009)</b></p> <p><math>f(z) = \frac{e^z}{z-2}</math>  <math>z=2</math> lies outside C.  <math>f(z)</math> is analytic inside and on C.  <math>f'(z)</math> is continuous in C, By Cauchy's integral theorem <math>\int\limits_c f(z) dz = 0</math></p>
13	<p><b>Define Taylor's series.</b>BTL1  If <math>f(z)</math> is analytic inside a circle C with its centre at <math>z = a</math> then, For all <math>z</math> inside c,</p> $f(z) = f(a) + \frac{f'(a)}{1!}(z-a) + \frac{f''(a)}{2!}(z-a)^2 + \dots + \frac{f^n(a)}{n!}(z-a)^n + \dots + \infty.$
14	<p><b>Define Laurent's series.</b>BTL1  If <math>C_1</math> and <math>C_2</math> are two concentric circles with centre "a" and radii <math>r_1</math> and <math>r_2</math> (<math>r_1 &lt; r_2</math>) and if <math>f(z)</math> is analytic on <math>C_1</math> and <math>C_2</math> and in the annulus region between them, then at any point z in R</p> $f(z) = \sum_{n=0}^{\infty} a_n (z-a)^n + \sum_{n=1}^{\infty} \frac{b_n}{(z-a)^n},$ <p>where <math>a_n = \frac{1}{2\pi i} \int\limits_{C_1} \frac{f(z)}{(z-a)^{n+1}} dz</math> and <math>b_n = \frac{1}{2\pi i} \int\limits_{C_2} \frac{f(z)}{(z-a)^{1-n}} dz</math> The integrals being taken in the anticlockwise direction.</p>
15	<p><b>Define Essential singularity.</b>BTL1  A singular point <math>z=a</math> is called an essential singular point of <math>f(z)</math> if the Laurent's series of <math>f(z)</math> containing negative powers of z.</p>
16	<p><b>Discuss the nature of singularities</b> <math>f(z) = e^{\frac{1}{z}}</math>.(NOV/DEC 2015)(MAY/JUNE 2012) BTL6</p> $\begin{aligned} f(z) = e^{\frac{1}{z}} &= 1 + \frac{\left(\frac{1}{z}\right)}{1!} + \frac{\left(\frac{1}{z}\right)^2}{2!} + \frac{\left(\frac{1}{z}\right)^3}{3!} + \dots \\ &= 1 + z^{-1} + \frac{z^{-2}}{2!} + \frac{z^{-3}}{3!} + \dots \end{aligned}$ <p>Therefore <math>z=0</math> is an essential singularity, since the principal part contains negative powers of z.</p>
17	<p><b>Define removable singularity.</b> BTL1  A singular point <math>z=a</math> is called a removable singular point of <math>f(z)</math>, if the Laurent's series of <math>f(z)</math> containing positive powers of z.</p>
18	<p><b>Find the nature of the singularity</b> <math>f(z) = \frac{\sin z}{z}</math>.BTL1</p>

	$f(z) = \frac{\sin z}{z} = \frac{1}{z} \left( z - \frac{z^3}{3!} + \frac{z^5}{5!} + \dots \right) = 1 - \frac{z^2}{3!} + \frac{z^4}{5!} - \dots$ <p>There is no negative power of <math>z</math>. Therefore <math>z=0</math> is a removable singularity.</p>
19	<p><b>Define isolated singularity with an example.BTL1</b> A point <math>z = z_0</math> is said to be isolated singularity of <math>f(z)</math></p> <p>i) If <math>f(z)</math> is not analytic at <math>z = z_0</math>, ii) There exist neighborhoods of <math>z = z_0</math> containing no other singularity</p> <p>Example: <math>f(z) = \frac{1}{(z-1)(z-2)}</math> has two isolated singularity namely <math>z=1</math> and <math>z=2</math>.</p>
20	<p><b>Find the singularities of</b> <math>f(z) = \frac{z^2+4}{z^2+2z+2}</math>.BTL1 Given <math>f(z) = \frac{z^2+4}{z^2+2z+2}</math>. [The singularities are poles] The poles of <math>f(z)</math> are given by equating the denominator to zero. <math>z^2 + 2z + 2 = 0</math>, <math>z = \frac{-2 \pm \sqrt{4-8}}{2} = -1 \pm i</math>. Which is a pole of order 1.</p>
21	<p><b>Find the singularities of the function</b> <math>f(z) = \frac{\cot \pi z}{(z-a)^3}</math>.BTL1 Given <math>f(z) = \frac{\cot \pi z}{(z-a)^3} = \frac{\cos \pi z}{\sin \pi z (z-a)^3}</math> i.e. <math>\sin \pi z (z-a)^3 = 0 \Rightarrow \sin \pi z = 0</math> (or) <math>(z-a)^3 = 0</math> Now <math>(z-a)^3 = 0</math> <math>z=a</math> is a pole of order 3 and then <math>\sin \pi z = 0</math> <math>\pi z = n\pi \Rightarrow z = \pm n</math>, <math>n = 0, 1, 2, 3, \dots</math> <math>z = \pm n</math> are simple poles.</p>
22	<p><b>State nature of the singularities of</b> <math>f(z) = \sin\left(\frac{1}{z+1}\right)</math>.BTL1 Given <math>f(z) = \sin\left(\frac{1}{z+1}\right)</math>  <math display="block">\sin\left(\frac{1}{z+1}\right) = \left(\frac{1}{z+1}\right) - \frac{\left(\frac{1}{z+1}\right)^3}{3!} + \frac{\left(\frac{1}{z+1}\right)^5}{5!} - \dots = \left(\frac{1}{z+1}\right) - \frac{1}{3!}\left(\frac{1}{z+1}\right)^3 + \frac{1}{5!}\left(\frac{1}{z+1}\right)^5 - \dots</math> <math>Z=-1</math> is an essential singularity.</p>
23	<p><b>Find the zeros of the function</b> <math>f(z) = \tan z</math> <b>and its pole.</b> (NOV/DEC 2016) BTL1 Given <math>f(z) = \tan z = \frac{\sin z}{\cos z} = \frac{P(z)}{Q(z)}</math> The poles are given by <math>\cos z = 0</math> <math>z = (2n+1)\frac{\pi}{2}</math> where <math>n = 0, \pm 1, \pm 2, \pm 3, \dots</math>  <math display="block">\operatorname{Res}[f(z), a] = \frac{P(a)}{Q'(a)}</math></p>

	<p>Now <math>\frac{P(z)}{Q'(z)} = \frac{\sin z}{-\sin z} = -1</math>  <math>\operatorname{Res} \left[ f(z), (2n+1)\frac{\pi}{2} \right] = -1 \text{ where } n = 0, \pm 1, \pm 2, \pm 3, \dots</math>  Hence the residue of each pole is -1</p>
24	<p><b>Find the zeros of the function <math>f(z) = \cot z</math> and its pole .BTL1</b></p> <p>Given <math>f(z) = \cot z = \frac{\cos z}{\sin z} = \frac{P(z)}{Q(z)}</math>  The poles are given by <math>\sin z = 0</math>  <math>z = n\pi \text{ where } n = 0, \pm 1, \pm 2, \pm 3, \dots</math></p> <p>Residue of <math>f(z)</math> at <math>z = n\pi</math> is <math>\frac{P[n\pi]}{Q'[n\pi]}</math></p> $\frac{P(z)}{Q'(z)} = \frac{\cos z}{\cos z}$ $\frac{P(z)}{Q'(z)} = \frac{\cos(2n+1)\frac{\pi}{2}}{\cos(2n+1)\frac{\pi}{2}} = 1 \quad \text{where } n = 0, \pm 1, \pm 2, \pm 3, \dots$
25	<p><b>Find residue of <math>f(z) = \frac{z^2}{(z-1)^2(z+2)}</math> and at its simple pole. BTL1</b></p> <p>Given <math>f(z) = \frac{z^2}{(z-1)^2(z+2)}</math></p> <p>The poles of <math>f(z)</math> are given by <math>(z-1)^2(z+2)=0</math>  <math>z=1</math> is a pole of order 2 and <math>z=-2</math> is a pole of order 1 [Simple pole]</p> <p>Residue of <math>f(z)</math> at <math>z=-2</math>: [simple Pole] <math>\operatorname{Res} \left[ f(z) \right]_{z=a} = \lim_{z \rightarrow a} (z-a)f(z)</math></p> $\operatorname{Res} \left[ f(z) \right]_{z=-2} = \lim_{z \rightarrow -2} (z+2) \frac{z^2}{(z-1)^2(z+2)} = \lim_{z \rightarrow -2} \frac{z^2}{(z-1)^2} = \frac{4}{9}$
26	<p>Evaluate <math>\int_C \frac{3z^2 + 7z + 1}{(z+1)} dz</math> where C is the circle <math> z  = \frac{1}{2}</math> (MAY/JUNE 2018 R-17) BTL3</p> <p>Here <math>z=-1</math> lies outside C. Therefore <math>\begin{cases} f(z) \text{ is analytic inside and on C.} \\ \text{And } f'(z) \text{ is Continuous inside C} \end{cases}</math></p> $\therefore \int_C f(z) dz = 0$
27	<p>If C is the circle <math> z  = 3</math> and if <math>g(z_0) = \int_C \frac{2z^2 - z - 2}{(z - z_0)} dz</math> then find <math>g(2)</math> (MAY/JUNE 2018 R-17) BTL3</p>

$$\int_C f(z) dz = 2\pi i [\text{sum of the residues}]$$

Here  $z=2$  is a pole order 1[Simple pole]

$$\{\text{Res } f(z)_{at z=2}\} = \lim_{z \rightarrow 2} (z-2) \left[ \frac{2z^2 - z - 2}{(z-2)} \right] = 4$$

$$\int_C \frac{2z^2 - z - 2}{(z-2)} dz = 8\pi i$$

### PART-B

**Use Cauchy's integral formula to evaluate  $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$  where C is the circle**

$|z|=3$  (MAY/JUNE 2016) (8 M) BTL3

**Answer : Refer Page No.4.10-Dr.M.CHANDRASEKAR**

1.

- $\frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} = \frac{1}{(z-2)} - \frac{1}{(z-1)}$  (2M)
- $\int_C \frac{f(z)}{(z-a)} dz = 2\pi i f(a)$  (2M)
- $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz = 4\pi i$  (4M)

**Use Cauchy's integral formula to evaluate  $\int_C \frac{z+4}{(z^2 + 2z + 5)} dz$  where C is the circle**

$|z+1-i|=3$  (NOV/DEC 2006) (NOV/DEC 2014) (8 M) BTL3

**Answer : Refer Page No.4.16-Dr.M.CHANDRASEKAR**

2.

- $\frac{z+4}{(z^2 + 2z + 5)} = \frac{\left(\frac{3+2i}{4i}\right)}{z - (-1+2i)} + \frac{\left(\frac{3-2i}{-4i}\right)}{z - (-1-2i)}$  (2M)
- $\int_C \frac{f(z)}{(z-a)} dz = 2\pi i f(a)$  (2M)
- $\int_C \frac{z+4}{(z^2 + 2z + 5)} dz = \frac{\pi(3+2i)}{2}$  (4M)

**Use Cauchy's integral formula to evaluate  $\int_C \frac{z}{(z-1)(z-2)} dz$  where C is the circle**

3.

$|z-2|=\frac{1}{2}$  (MAY/JUNE 2015) (8 M) BTL3

**Answer : Refer Page No.4.24-Dr.M.CHANDRASEKAR**

	<ul style="list-style-type: none"> <li>• <math>\int_C \frac{f(z)}{(z-a)} dz = 2\pi i f(a)</math> (2M)</li> <li>• <math>\int_C \frac{z}{(z-1)(z-2)} dz = 4\pi i</math> (6M)</li> </ul>
4.	<p><b>Use Cauchy's integral formula to evaluate <math>\int_C \frac{z+1}{(z-3)(z-1)} dz</math> where C is the circle <math> z =2</math></b>  <b>(MAY/JUNE 2016) (8 M) BTL3</b>  <b>Answer : Refer Page No.4.29-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>\int_C \frac{f(z)}{(z-a)} dz = 2\pi i f(a)</math> (2M)</li> <li>• <math>\int_C \frac{z+1}{(z-3)(z-1)} dz = -2\pi i</math> (6M)</li> </ul>
5.	<p><b>Use Cauchy's integral formula to evaluate <math>\int_C \frac{z-1}{(z-2)(z+1)^2} dz</math> where C is the circle <math> z-i =2</math> (8 M) BTL3</b>  <b>Answer : Refer Page No.4.31-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>\int_C \frac{f(z)}{(z-a)^{n+1}} dz = \begin{cases} \frac{2\pi i}{n!} f^{(n)}(a) &amp; ; a \text{ lies inside } C \\ 0 &amp; ; a \text{ lies outside } C \end{cases}</math> (2M)</li> <li>• <math>\int_C \frac{z-1}{(z-2)(z+1)^2} dz = -\frac{2\pi i}{9}</math> (6M)</li> </ul>
6.	<p><b>Use Cauchy's integral formula to evaluate <math>\int_C \frac{z^2}{(z^2+1)^2} dz</math> where C is the circle <math> z-i =1</math></b>  <b>(MAY/JUNE 2018 R-17)(8 M)BTL3</b>  <b>Answer : Refer Page No.4.30-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>\int_C \frac{f(z)}{(z-a)^{n+1}} dz = \begin{cases} \frac{2\pi i}{n!} f^{(n)}(a) &amp; ; a \text{ lies inside } C \\ 0 &amp; ; a \text{ lies outside } C \end{cases}</math> (2M)</li> <li>• <math>\int_C \frac{z^2}{(z^2+1)^2} dz = \frac{\pi}{2}</math> (6M)</li> </ul>
7.	<p><b>Use Cauchy's integral formula to evaluate <math>\int_C \frac{z+1}{(z^2+2z+4)} dz</math> where C is the circle <math> z+1+i =2</math>.</b> (8 M) BTL3  <b>Answer : Refer Page No.4.39-Dr.M.CHANDRASEKAR</b></p>

	<ul style="list-style-type: none"> <li>• <math>\int_C \frac{f(z)}{(z-a)} dz = 2\pi i f(a)</math>. (2M)</li> <li>• <math>\int_C \frac{z+1}{(z^2+2z+4)} dz = \pi i</math> (6M)</li> </ul>
	<p><b>Expand <math>\frac{z^2-1}{(z+2)(z+3)}</math> in the appropriate series in the regions (i) <math>2 &lt;  z  &lt; 3</math> (ii) <math> z  &gt; 3</math> using Laurent's series. (8 M)BTL2</b></p> <p><b>Answer : Refer Page No.4.51-Dr.M.CHANDRASEKAR</b></p>
8.	<ul style="list-style-type: none"> <li>• <math>f(z) = 1 + \frac{3}{z+2} - \frac{8}{z+3}</math> (2M)</li> <li>(i) In <math>2 &lt;  z  &lt; 3</math>,</li> <li>• <math>f(z) = 1 + \frac{3}{z} \sum_{n=0}^{\infty} (-1)^n \left(\frac{2}{z}\right)^n - \frac{8}{3} \sum_{n=0}^{\infty} (-1)^n \left(\frac{z}{3}\right)^n</math> (3M)</li> <li>(ii) In <math> z  &gt; 3</math>,</li> <li>• <math>f(z) = 1 + \frac{3}{z} \sum_{n=0}^{\infty} (-1)^n \left(\frac{2}{z}\right)^n - \frac{8}{z} \sum_{n=0}^{\infty} (-1)^n \left(\frac{3}{z}\right)^n</math> (3M)</li> </ul>
	<p><b>Expand <math>f(z) = \frac{7z-2}{z(z-2)(z+1)}</math> in Laurent's series in the regions (i) <math>2 &lt;  z  &lt; 3</math> (ii) <math> z  &gt; 3</math> (8 M)BTL2</b></p> <p><b>Answer : Refer Page No.4.52-Dr.M.CHANDRASEKAR</b></p>
9.	<ul style="list-style-type: none"> <li>• <math>f(z) = \frac{1}{z} + \frac{2}{z-2} - \frac{3}{z+1}</math> (2M)</li> <li>(i) In <math>2 &lt;  z  &lt; 3</math>,</li> <li>• <math>f(z) = \frac{1}{z} + \sum_{n=0}^{\infty} \left(\frac{2}{z}\right)^{n+1} + 3 \sum_{n=0}^{\infty} (-1)^{n+1} \left(\frac{1}{z}\right)^{n+1}</math> (3M)</li> <li>(ii) In <math> z  &gt; 3</math>,</li> <li>• <math>f(z) = \frac{1}{z} + \sum_{n=0}^{\infty} \left(\frac{2}{z}\right)^{n+1} + 3 \sum_{n=0}^{\infty} (-1)^{n+1} \left(\frac{1}{z}\right)^{n+1}</math> (3M)</li> </ul>
10.	<p><b>Expand <math>f(z) = \frac{7z-2}{z(z-2)(z+1)}</math> in Laurent's series in the region (i) <math> z  &lt; 2</math> (ii) <math>1 &lt;  z+1  &lt; 3</math> (MAY/JUNE 2014) (8 M)BTL2</b></p> <p><b>Answer : Refer Page No.4.52-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li>• <math>f(z) = \frac{1}{z} + \frac{2}{z-2} - \frac{3}{z+1}</math> (2M)</li> </ul>

	<p>(i) In <math> z  &lt; 2</math>,</p> <ul style="list-style-type: none"> <li><math>f(z) = \frac{1}{z} - \sum_{n=0}^{\infty} \left(\frac{z}{2}\right)^n - 3 \sum_{n=0}^{\infty} (z)^n</math> (3M)</li> </ul> <p>(ii) In <math>1 &lt;  z+1  &lt; 3</math>,</p> <ul style="list-style-type: none"> <li><math>f(z) = \frac{-3}{z+1} + \sum_{n=1}^{\infty} \left(\frac{1}{z+1}\right)^n - \frac{2}{3} \sum_{n=0}^{\infty} \left(\frac{z+1}{3}\right)^n</math> (3M)</li> </ul>
	<p><b>Expand <math>f(z) = \frac{6z+5}{z(z-2)(z+1)}</math> in Laurent's series in the region <math>1 &lt;  z+1  &lt; 3</math></b></p> <p><b>(MAY/JUNE 2018 R-17) (8 M)BTL2</b></p> <p><b>Answer : Refer Page No.4.56-Dr.M.CHANDRASEKAR</b></p>
11.	<ul style="list-style-type: none"> <li><math>f(z) = \frac{-5}{2z} + \frac{17}{6(z-2)} - \frac{1}{3(z+1)}</math> (2M)</li> </ul> <p>In <math>1 &lt;  z+1  &lt; 3</math>,</p> <ul style="list-style-type: none"> <li><math>f(z) = \frac{-1}{3(z+1)} - \frac{5}{2(z+1)} \sum_{n=0}^{\infty} \left(\frac{1}{z+1}\right)^n - \frac{17}{8} \sum_{n=0}^{\infty} \left(\frac{z+1}{3}\right)^n</math> (6M)</li> </ul>
	<p><b>Expand <math>f(z) = \frac{1}{(z-1)(z-2)}</math> in Laurent's series in the region (i) <math> z  &gt; 2</math> (ii) <math>0 &lt;  z-1  &lt; 1</math></b></p> <p><b>(NOV/DEC 2014) (8 M)BTL2</b></p> <p><b>Answer : Refer Page No.4.57-Dr.M.CHANDRASEKAR</b></p>
12.	<ul style="list-style-type: none"> <li><math>f(z) = \frac{-1}{z-1} + \frac{1}{z-2}</math> (2M)</li> </ul> <p>(i) In <math> z  &gt; 2</math>,</p> <ul style="list-style-type: none"> <li><math>f(z) = - \sum_{n=0}^{\infty} \left(\frac{1}{z}\right)^n + \frac{1}{z} \sum_{n=0}^{\infty} \left(\frac{2}{z}\right)^n</math> (3M)</li> </ul> <p>(ii) In <math>0 &lt;  z-1  &lt; 1</math>,</p> <ul style="list-style-type: none"> <li><math>f(z) = \frac{-1}{z-1} + \sum_{n=0}^{\infty} (z-1)^n</math> (3M)</li> </ul>
13.	<p><b>Use Cauchy's Residue theorem to evaluate <math>\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz</math> where C is the circle <math> z =3</math></b> (NOV/DEC 2015) (8 M)BTL3</p> <p><b>Answer : Refer Page No.4.96-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math>\int_C f(z) dz = 2\pi i [\text{sum of the residues}]</math> (2M)</li> </ul>

	<ul style="list-style-type: none"> <li><math>\left\{ \text{Res } f(z)_{at z=2} \right\} = 1</math> (4M)</li> <li><math>\left\{ \text{Res } f(z)_{at z=1} \right\} = -2\pi + 1</math></li> <li><math>\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz = 4\pi i(1-\pi)</math> (2M)</li> </ul>
	<p><b>Use Cauchy's Residue theorem to evaluate <math>\int_C \frac{12z-7}{(z-1)^2(2z+3)} dz</math> where C is the circle <math> z =2</math></b>  <b>(8 M) BTL3</b></p> <p><b>Answer : Refer Page No.4.92-Dr.M.CHANDRASEKAR</b></p>
14.	<ul style="list-style-type: none"> <li><math>\int_C f(z) dz = 2\pi i</math> [sum of the residues] (2M)</li> <li><math>\left\{ \text{Res } f(z)_{at z=-\frac{3}{2}} \right\} = -4</math> (4M)</li> <li><math>\left\{ \text{Res } f(z)_{at z=1} \right\} = 4</math></li> <li><math>\int_C \frac{12z-7}{(z-1)^2(2z+3)} dz = 0</math> (2M)</li> </ul>
15.	<p><b>Use Cauchy's Residue theorem to evaluate <math>\int_C \frac{z^2}{(z+1)^2(z^2+4)} dz</math> where C is the circle <math> z =3</math></b> (8 M) BTL3</p> <p><b>Answer : Refer Page No.4.99-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math>\int_C f(z) dz = 2\pi i</math> [sum of the residues] (2M)</li> <li><math>\left\{ \text{Res } f(z)_{at z=-1} \right\} = -\frac{8}{25}</math></li> <li><math>\left\{ \text{Res } f(z)_{at z=2i} \right\} = \frac{-4}{(1+2i)^2(4i)}</math> (4M)</li> <li><math>\left\{ \text{Res } f(z)_{at z=-2i} \right\} = \frac{-4}{(1-2i)^2(-4i)}</math></li> <li><math>\int_C \frac{z^2}{(z+1)^2(z^2+4)} dz = 0</math> (2M)</li> </ul>
16.	<p><b>Use Cauchy's Residue theorem to evaluate <math>\int_C \frac{dz}{(z^2+4)^2}</math> where C is the circle <math> z-i =2</math></b>  <b>(8 M) BTL3</b></p> <p><b>Answer : Refer Page No.4.100-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math>\int_C f(z) dz = 2\pi i</math> [sum of the residues] (2M)</li> </ul>

	<ul style="list-style-type: none"> <li><math>\{\text{Res } f(z)_{at z=2i}\} = \frac{1}{32i}</math> (4M)</li> <li><math>\{\text{Res } f(z)_{at z=-2i}\} = 0</math></li> <li><math>\int_C \frac{dz}{(z^2+4)^2} = \frac{\pi}{16}</math> (2M)</li> </ul>
	<p>Evaluate <math>\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos \theta} d\theta</math> by using Contour integration (MAY/JUNE 2018 R-17)  <b>(16M) BTL5</b>  <b>Answer : Refer Page No.4.105-Dr.M.CHANDRASEKAR</b></p>
17.	<ul style="list-style-type: none"> <li><math>\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos \theta} d\theta = \frac{1}{4i} \int_C \frac{(z^2+1)dz}{z^2(z+1/2)(z+2)}</math> (4M)</li> <li><math>\int_C f(z)dz = 2\pi i</math> [sum of the residues] (2M)</li> <li><math>\{\text{Res } f(z)_{at z=0}\} = \frac{-5}{2}</math></li> <li><math>\{\text{Res } f(z)_{at z=-1/2}\} = \frac{17}{6}</math> (8M)</li> <li><math>\{\text{Res } f(z)_{at z=-2}\} = 0</math></li> <li><math>\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos \theta} d\theta = \frac{\pi}{6}</math> (2M)</li> </ul>
18.	<p>Prove that <math>\int_0^{2\pi} \frac{d\theta}{5+4\sin \theta} = \frac{2\pi}{3}</math> by using Contour integration. (NOV/DEC 2006) (8 M)  <b>BTL5</b>  <b>Answer : Refer Page No.4.120-Dr.M.CHANDRASEKAR</b></p> <ul style="list-style-type: none"> <li><math>\int_0^{2\pi} \frac{d\theta}{5+4\sin \theta} = \int_C \frac{dz}{(z+2i)(2z+i)}</math> (3M)</li> <li><math>\int_C f(z)dz = 2\pi i</math> [sum of the residues] (1M)</li> <li><math>\{\text{Res } f(z)_{at z=-i/2}\} = \frac{1}{3i}</math> (3M)</li> <li><math>\{\text{Res } f(z)_{at z=-2i}\} = 0</math></li> <li><math>\int_0^{2\pi} \frac{d\theta}{5+4\sin \theta} = \frac{2\pi}{3}</math> (1M)</li> </ul>
19.	<p>Evaluate <math>\int_0^{2\pi} \frac{d\theta}{13+5\sin \theta}</math> by using Contour integration. (NOV/DEC 2014) (8 M) BTL5</p>

**Answer : Refer Page No.4.123-Dr.M.CHANDRASEKAR**

- $\int_0^{2\pi} \frac{d\theta}{13+5\sin\theta} = \int_C \frac{2dz}{(5z+i)(2+5i)} \quad (3M)$
- $\int_C f(z)dz = 2\pi i \text{ [sum of the residues]} \quad (1M)$
- $\left\{ \text{Res } f(z)_{at z=5i} \right\} = 0$
- $\left\{ \text{Res } f(z)_{at z=-\frac{i}{5}} \right\} = \frac{1}{12i} \quad (3M)$
- $\int_0^{2\pi} \frac{d\theta}{13+5\sin\theta} = \frac{\pi}{6} \quad (1M)$

Evaluate  $\int_{-\infty}^{\infty} \frac{x^2 dx}{(x^2 + 1)(x^2 + 4)}$  by using Contour integration. (NOV/DEC 2008) (8 M) BTL5

**Answer : Refer Page No.4.92-Dr.G.BALAJI**

- 20.
- $\int_{-\infty}^{\infty} \frac{x^2 dx}{(x^2 + 1)(x^2 + 4)} = \int_C \frac{z^2}{(z^2 + 1)(z^2 + 4)} dz \quad (1M)$
  - $\int_C f(z)dz = 2\pi i \text{ [sum of the residues]} \quad (1M)$
  - $\left\{ \text{Res } f(z)_{at z=i} \right\} = \frac{i}{6}$
  - $\left\{ \text{Res } f(z)_{at z=2i} \right\} = -\frac{i}{3} \quad (3M)$
  - $\int_{-\infty}^{\infty} \frac{x^2 dx}{(x^2 + 1)(x^2 + 4)} = \frac{\pi}{3} \quad (3M)$

Evaluate  $\int_0^{\infty} \frac{\cos mx}{(x^2 + a^2)} dx$  by using Contour integration. (NOV/DEC 2016) (8 M) BTL5

**Answer : Refer Page No.4.101-Dr.G.BALAJI**

- 21.
- $\int_0^{\infty} \frac{\cos mx dx}{(x^2 + a^2)} = R.P \text{ of } \int_C \frac{e^{mz}}{(z^2 + a^2)} dz \quad (1M)$
  - $\int_C f(z)dz = 2\pi i \text{ [sum of the residues]} \quad (1M)$
  - $\left\{ \text{Res } f(z)_{at z=ai} \right\} = \frac{e^{-ma}}{2ai} \quad (3M)$

	<ul style="list-style-type: none"> <li>• <math>\int_0^{\infty} \frac{\cos mx}{(x^2 + a^2)} dx = \frac{\pi e^{-ma}}{2a}</math> (3M)</li> </ul>
--	---

	<b>UNIT V LAPLACETRANSFORMS</b>
	<b>Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constantcoefficients.</b>
	<b>PART * A</b>
<b>Q.No.</b>	<b>Questions</b>
1.	<p><b>State the sufficient condition for the existence of Laplace transforms.</b>  <b>(OR) State the conditions under which the Laplace Transform of <math>f(t)</math> exists.</b>  <b>(APR/MAY 2015, 2017 R-13)BTL1</b></p> <p>The Laplace transform of <math>f(t)</math> exists if</p> <ol style="list-style-type: none"> <li><math>f(t)</math> is piecewise continuous in <math>[a, b]</math> where <math>a &gt; 0</math>.</li> <li><math>f(t)</math> is of exponential order.</li> </ol>
2.	<p><b>Is the linearity property applicable to <math>L\left[\frac{1-\cos t}{t}\right]</math>?Reason out?BTL5</b></p> <p>Given, <math>L\left[\frac{1-\cos t}{t}\right] = L\left[\frac{1}{t}\right] - L\left[\frac{\cos t}{t}\right]</math> by linearity property, provided the result exists.</p> <p><math>L\left[\frac{1}{t}\right]</math> does not exist. Since <math>\lim_{t \rightarrow 0} \frac{1}{t} = \frac{1}{0} = \infty</math>.</p> <p><math>L\left[\frac{\cos t}{t}\right]</math> does not exist. Since, <math>\lim_{t \rightarrow 0} \frac{\cos t}{t} = \frac{1}{0} = \infty</math>.</p> <p><math>\therefore</math> Linearity property is not applicable to <math>L\left[\frac{1-\cos t}{t}\right]</math>.</p>
3.	<p><b>If <math>L[F(t)] = F(s)</math>, Prove that <math>L\left[f\left(\frac{t}{5}\right)\right] = 5F(5s)</math>.BTL5</b></p> $L[f(t)] = \int_0^{\infty} e^{-st} f(t) dt$ <p>put <math>\frac{t}{5} = u \Rightarrow 5du = dt</math></p> $L\left[f\left(\frac{t}{5}\right)\right] = \int_0^{\infty} e^{-(5s)u} f(u) 5du$ $= 5 \int_0^{\infty} e^{-(5s)u} f(u) du = 5F(5s)$
4	<p><b>Find the Laplace transform of unit step function.BTL1</b></p> <p>The unit step function is <math>u_a(t) = \begin{cases} 0 &amp; t &lt; a \\ 1 &amp; t &gt; a, \end{cases} \quad a \geq 0</math></p> <p>The Laplace transform <math>L[f(t)] = \int_0^{\infty} e^{-st} f(t) dt = \int_a^{\infty} e^{-st} (1) dt = \left[ \frac{e^{-st}}{-s} \right]_a^{\infty} = -\frac{1}{s} [e^{-\infty} - e^{-as}] = \frac{e^{-as}}{s}</math>.</p>

	<b>Prove that</b> $L\left(\int_0^t f(t)dt\right) = \frac{F(s)}{s}$ where $L[f(t)] = F(s)$ . [DEC 2016 R-13]BTL5
5	<p>Let <math>F(t) = \int_0^t f(t)dt</math></p> $F'(t) = f(t)$ $L[F'(t)] = sL[F(t)] - F(0) = sL[F(t)] - 0$ $L[f(t)] = sL[F(t)] = sL\left[\int_0^t f(t)dt\right]$ $\therefore L\left(\int_0^t f(t)dt\right) = \frac{F(s)}{s}$
6	<p><b>Does</b> <math>L\left[\frac{\cos at}{t}\right]</math> exist? BTL4</p> $Lt \frac{f(t)}{t} = Lt \frac{\cos at}{t} = \frac{1}{0} = \infty$ $\therefore L\left[\frac{\cos at}{t}\right] \text{ does not exist.}$
7	<p><b>Obtain the Laplace transform of</b> <math>\sin 2t - 2t \cos 2t</math>. BTL3</p> $L[\sin 2t - 2t \cos 2t] = L[\sin 2t] - 2L[t \cos 2t] = L[\sin 2t] - 2\left(-\frac{d}{ds}L[\cos 2t]\right)$ $= \frac{2}{s^2 + 4} + 2\frac{d}{ds}\left(\frac{s}{s^2 + 4}\right) = \frac{2}{s^2 + 4} + 2\left(\frac{(s^2 + 4)(1) - s(2s)}{(s^2 + 4)^2}\right)$ $= \frac{2(s^2 + 4) + 2(4 - s^2)}{(s^2 + 4)^2} = \frac{16}{(s^2 + 4)^2}.$
8	<p><b>Find</b> <math>L^{-1}\left[\frac{s+2}{s^2+2s+2}\right]</math>. BTL4</p> $L^{-1}\left[\frac{s+2}{s^2+2s+2}\right] = L^{-1}\left[\frac{(s+1)+1}{(s+1)^2+1}\right] \quad \{ \because L^{-1}[F(s+a)] = e^{-at}L^{-1}[F(s)] \}$ $= L^{-1}\left[\frac{(s+1)}{(s+1)^2+1}\right] + L^{-1}\left[\frac{1}{(s+1)^2+1}\right]$ $= e^{-t}\left(L^{-1}\left[\frac{s}{s^2+1}\right] + L^{-1}\left[\frac{1}{s^2+1}\right]\right)$ $= e^{-t}(\cos t + \sin t).$
9	<p><b>What is the Laplace transform of</b> <math>f(t)</math>, <math>0 &lt; t &lt; 10</math> with <math>f(t) = f(t + 10)</math>? BTL3</p> <p>Given <math>f(t)</math> is a periodic function with period <math>p</math>.</p> $L[f(t)] = \frac{1}{1-e^{-ps}} \int_0^p e^{-st} f(t) dt$ <p>put <math>p = 10</math>, <math>L[f(t)] = \frac{1}{1-e^{-10s}} \int_0^{10} e^{-st} f(t) dt</math></p>

	<b>State and Prove Linearity property. [MAY/JUNE 2016]BTL1</b> <i>Statement:</i> $L[af(t) \pm bg(t)] = aL[f(t)] \pm bL[g(t)]$
10	<p><i>proof :</i> <math>L[f(t)] = \int_0^\infty e^{-st} f(t) dt</math></p> $\begin{aligned} L[af(t) \pm bg(t)] &= \int_0^\infty e^{-st} L[af(t) \pm bg(t)] dt \\ &= \int_0^\infty e^{-st} af(t) dt \pm \int_0^\infty e^{-st} bg(t) dt \\ &= a \int_0^\infty e^{-st} f(t) dt \pm b \int_0^\infty e^{-st} g(t) dt \\ &= aL[f(t)] \pm bL[g(t)]. \end{aligned}$
11	<b>Find</b> $L^{-1}\left(\frac{S}{S^2 + 4S + 5}\right)$ . [MAY/JUNE 2016]BTL3 $\begin{aligned} L^{-1}\left(\frac{S}{S^2 + 4S + 5}\right) &= L^{-1}\left(\frac{(S+2)-2}{(S+2)^2+1}\right) = e^{-2t} L^{-1}\left(\frac{S-2}{S^2+1}\right) \\ &= e^{-2t} \left[ L^{-1}\left(\frac{S-2}{S^2+1}\right) - 2L^{-1}\left(\frac{1}{S^2+1}\right) \right] = e^{-2t} [\cos t - 2\sin t]. \end{aligned}$
12	<b>Find</b> $L[te^{-3t} \cos 2t]$ .BTL3 We know that $L[t \cos at] = \frac{s^2 - a^2}{(s^2 + a^2)^2}$ , $L[te^{-3t} \cos 2t] = \left[ \frac{s^2 - 2^2}{(s^2 + 2^2)^2} \right]_{s \rightarrow s+3} = \frac{(s+3)^2 - 2^2}{((s+3)^2 + 2^2)^2}$
13	<b>Find</b> $L^{-1}\left[\tan^{-1}\left(\frac{1}{s}\right)\right]$ . BTL3 Let $F(s) = \tan^{-1}\left(\frac{1}{s}\right)$ $F'(s) = \frac{1}{1 + \left(\frac{1}{s}\right)^2} \left(-\frac{1}{s^2}\right) = \frac{-1}{s^2 + 1}$ By property $L^{-1}[F'(s)] = -L^{-1}\left[\frac{1}{s^2 + 1}\right] = -\sin t$ $\therefore L^{-1}[F'(s)] = -\sin t$ ; $L^{-1}[F(s)] = \frac{-1}{t} L^{-1}[F'(s)]$ $L^{-1}\left[\tan^{-1}\left(\frac{1}{s}\right)\right] = \frac{\sin t}{t}$ .
14	<b>Solve using Laplace transform</b> $\frac{dy}{dt} + y = e^{-t}$ given that $y(0) = 0$ .BTL3 Taking Laplace transform on both sides, we get

	$L[y'(t)] + L[y(t)] = L[e^{-t}]$ $sL[y(t)] - y(0) + L[y(t)] = L[e^{-t}]$ $sL[y(t)] - 0 + L[y(t)] = \frac{1}{s+1}$ $(s+1)L[y(t)] = \frac{1}{s+1}$ $L[y(t)] = \left( \frac{1}{(s+1)^2} \right)$ $\therefore y(t) = L^{-1}\left( \frac{1}{(s+1)^2} \right) = e^{-t} L\left( \frac{1}{s^2} \right) = e^{-t} t.$ $\{\because L[e^{-at} f(t)] = F(s+a)\}$
15	<p><b>Given an example for a function that do not have Laplace transform.BTL5</b></p> <p>Consider <math>f(t) = e^{t^2}</math>, since <math>\lim_{t \rightarrow \infty} Lt e^{-st} e^{t^2} = \infty</math>, hence <math>e^{t^2}</math> is not exponential order.</p> <p>Hence <math>f(t) = e^{t^2}</math> does not have Laplace transform.</p>
16	<p><b>Can <math>F(s) = \frac{s^3}{(s+1)^2}</math> be the Laplace transform of some <math>f(t)</math>?BTL5</b></p> <p><math>Lt F(s) = \lim_{s \rightarrow \infty} Lt \frac{s^3}{(s+1)^2} \neq 0</math></p> <p>Hence <math>F(s)</math> cannot be Laplace transform of <math>f(t)</math>.</p>
17	<p><b>Evaluate <math>\int_0^t \sin u \cos(t-u) du</math> using Laplace Transform.BTL3</b></p> <p>Let <math>L\left[ \int_0^t \sin u \cos(t-u) du \right] = L[\sin t * \cos t]</math></p> $= L[\sin t] L[\cos t] \quad (\text{by convolution theorem})$ $= \frac{1}{(s^2+1)} \frac{s}{(s^2+1)} = \frac{s}{(s^2+1)^2}.$ $\int_0^t \sin u \cos(t-u) du = L^{-1}\left[ \frac{s}{(s^2+1)^2} \right] = \frac{1}{2} L^{-1}\left[ \frac{2s}{(s^2+1)^2} \right] = \frac{t}{2} \sin t.$ $\left[ \because L^{-1}\left( \frac{2s}{(s^2+1)^2} \right) = t \sin at \right].$
18	<p><b>Given an example for a function having Laplace transform but not satisfying the continuity condition.BTL1</b></p> <p><math>f(t) = t^{-\frac{1}{2}}</math> has Laplace transform even though it does not satisfy the continuity condition. (i.e.) It is not piecewise continuous in <math>(0, \infty)</math> as <math>\lim_{t \rightarrow 0} Lt f(t) = \infty</math>.</p>
19	<p><b>Define a Periodic function with example.BTL1</b></p> <p><math>f(t)</math> for all <math>t</math>. The least value of <math>p &gt; 0</math> is called the period of <math>f(t)</math>. For example, <math>\sin t</math> and <math>\cos t</math> are periodic functions with period <math>2\pi</math>.</p>
20	<p><b>If <math>L[f(t)] = F(s)</math>, find <math>L[f(at)]</math>. [APR/MAY 2018 R-17]BTL5</b></p>

	$L[f(at)] = \int_0^{\infty} e^{-st} f(at) dt$ <p>put <math>u = at</math></p> $L[f(at)] = \int_0^{\infty} e^{-st} f(u) \frac{du}{a} = \frac{1}{a} \int_0^{\infty} e^{-\left(\frac{s}{a}\right)u} f(u) du = \frac{1}{a} F\left(\frac{s}{a}\right).$
21	<b>Find the Laplace transform of <math>\frac{t}{e^t}</math>.</b> [APR/MAY 2018 R-17]BTL3 $L\left[\frac{t}{e^t}\right] = L[e^{-t}t] = \left[\frac{1}{s^2}\right]_{s \rightarrow s+1} = \frac{1}{(s+1)^2}.$
22	<b>State Convolution theorem on Laplace Transform.</b> [MAY/JUNE 2017 R-13]BTL1 The Laplace transform of convolution of two functions is equal to the product of their Laplace transform. (i.e) $L[f(t)*g(t)] = L[f(t)]L[g(t)]$ .
23	<b>Find <math>L\left[\frac{1}{\sqrt{t}}\right]</math>.</b> [APR/MAY 2017 R-13]BTL3 We know that, $L[t^n] = \frac{\Gamma(n+1)}{s^{n+1}}$ $L\left[\frac{1}{\sqrt{t}}\right] = L[t^{-\frac{1}{2}}]$ $= \frac{\Gamma(-\frac{1}{2}+1)}{s^{-\frac{1}{2}+1}}$ $= \frac{\Gamma(\frac{1}{2})}{s^{\frac{1}{2}}} = \sqrt{\frac{\pi}{s}}.$
24	<b>Find the Laplace transform <math>\sin^3(2t)</math>.</b> BTL3 $L[\sin^3(2t)] = \frac{1}{4} L[3\sin 2t - \sin 6t]$ $= \frac{3}{4} L[\sin 2t] - \frac{1}{4} L[\sin 6t]$ $\quad (\because \sin^3 t = \frac{1}{4}[3\sin t - \sin 3t])$ $= \frac{3}{4} \left( \frac{2}{s^2 + 4} \right) - \frac{1}{4} \left( \frac{6}{s^2 + 36} \right)$ $= \frac{6}{4} \left\{ \left( \frac{1}{s^2 + 4} \right) - \left( \frac{1}{s^2 + 36} \right) \right\}$
25	<b>Find the Laplace transform of <math>e^{-2t}t^{1/2}</math>.</b> BTL3

	$L(e^{-2t}t^{1/2}) = L[t^{1/2}]_{s \rightarrow s+2}$ $\therefore \text{if } L[f(t)] = F(s), \text{ then } l[e^{-at}f(t)] = F(s) \Big _{s \rightarrow s+2}$ $\left[ \frac{\Gamma\left(\frac{1}{2}+1\right)}{s^{\frac{3}{2}}} \right]_{s \rightarrow s+2} = \left[ \frac{\frac{1}{2}\Gamma\left(\frac{1}{2}\right)}{s^{\frac{3}{2}}} \right]_{s \rightarrow s+2}$ $= \frac{\frac{1}{2}\sqrt{\pi}}{(s+2)^{\frac{3}{2}}} \quad \left( \because \Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}, \quad \Gamma n + 1 = n\Gamma n \right).$
26	<p><b>Does <math>L\left[\frac{\cos at}{t}\right]</math> exist?</b> BTL5</p> $Lt \frac{f(t)}{t} = Lt \frac{\cos at}{t} = \frac{1}{0} = \infty$ $\therefore L\left[\frac{\cos at}{t}\right] \text{ does not exist.}$
27	<p><b>Using Laplace transform, Evaluate <math>\int_0^\infty te^{-2t} \sin t dt</math>. [APR/MAY 2015 R-13] BTL3</b></p> $\int_0^\infty e^{-2t} f(t) dt = \left[ \int_0^\infty e^{-st} f(t) dt \right]_{s=2} = [L[t \sin t]]_{s=2} = \left[ -\frac{d}{ds} L[\sin t] \right]_{s=2} = -\frac{d}{ds} \left( \frac{1}{s^2 + 1} \right) = \frac{4}{25}$
	<b>Part*B</b>
	<p><b>Find</b></p> <ol style="list-style-type: none"> <li>1) <math>L\left[\frac{\sinh 2t}{t}\right]</math>.</li> <li>2) <math>L\left[\frac{e^{-t} \sin t}{t}\right]</math></li> <li>3) <math>L\left[\frac{\cos at - \cos bt}{t}\right]</math>. [APR/MAY 2011,2015, NOV/DEC 2012,2016 R-13] (12M) BTL3</li> </ol> <p><b>Answer:</b> Refer Page No:5.35-Dr. G. Balaji.</p> <p>1)</p> $L\left[\frac{\sinh 2t}{t}\right] = \int_s^\infty L[\sinh 2t] ds = \int_s^\infty \frac{2}{s^2 - 4} ds = 2 \left[ \frac{1}{2(2)} \log \left( \frac{s-2}{s+2} \right) \right]_s^\infty$ $= \frac{1}{2} \left[ \log \frac{s+2}{s-2} \right] = \log \sqrt{s+2} / s-2 \quad (4M)$ <p>2)</p> $L\left[\frac{e^{-t} \sin t}{t}\right] = \left[ L\left[\frac{\sin t}{t}\right] \right]_{s \rightarrow s+1}$ $= \left[ \cot^{-1} s \right]_{s \rightarrow (s+1)} = \cot^{-1}(s+1). \quad (3M)$ <p>3)</p>

	$L\left[\frac{\cos at - \cos bt}{t}\right] = \int_s^{\infty} L[\cos at - \cos bt] ds$ $= \int_s^{\infty} \left[ \frac{s}{s^2 + a^2} - \frac{s}{s^2 + b^2} \right] ds = \frac{1}{2} \left[ \log(s^2 + a^2) - \log(s^2 + b^2) \right]_s^{\infty} = \frac{1}{2} \log \frac{s^2 + b^2}{s^2 + a^2}. \quad (5M)$
	<p><b>1) State and prove Initial Value and Final value theorem. [APR/MAY 2017 R-13]</b>  <b>2) Verify the initial and Final value theorem for <math>f(t) = 1 + e^t (\sin t + \cos t)</math>. [NOV/DEC 2009, MAY/JUNE 2012 R-13]</b>  <b>3) Using the initial value theorem, find <math>\lim_{s \rightarrow \infty} sL[f(t)]</math> for the function <math>f(t) = e^{-t} \cos t</math>. [NOV/DEC 2016 R-13] (16M) BTL3</b></p> <p><b>Answer: Refer Page No:5.40-Dr. G. Balaji.</b></p> <p>1) <u>Initial Value theorem Statement:</u> <math>L[f(t)] = F(s)</math>, then <math>\lim_{t \rightarrow 0} f(t) = \lim_{s \rightarrow \infty} sF(s)</math>.</p> <p>Proof : We know that <math>L[f'(t)] = sL[f(t)] - f(0) = sF(s) - f(0)</math></p> $= \int_0^{\infty} e^{-st} f'(t) dt$ $\lim_{s \rightarrow \infty} [sF(s) - f(0)] = \lim_{s \rightarrow \infty} \int_0^{\infty} e^{-st} f'(t) dt = \lim_{s \rightarrow \infty} sF(s) - f(0) = 0$ <p>hence <math>\lim_{t \rightarrow 0} f(t) = \lim_{s \rightarrow \infty} sF(s)</math>. (2M)</p> <p><u>Final Value theorem Statement:</u> <math>L[f(t)] = F(s)</math>, then <math>\lim_{t \rightarrow \infty} f(t) = \lim_{s \rightarrow 0} sF(s)</math>.</p> <p>Proof : We know that <math>L[f'(t)] = sL[f(t)] - f(0) = sF(s) - f(0)</math></p> $= \int_0^{\infty} e^{-st} f'(t) dt$ $\lim_{s \rightarrow 0} [sF(s) - f(0)] = \lim_{s \rightarrow 0} \int_0^{\infty} e^{-st} f'(t) dt = \lim_{s \rightarrow 0} sF(s) - f(0) = f(\infty) - f(0)$ <p>hence <math>\lim_{t \rightarrow \infty} f(t) = \lim_{s \rightarrow 0} sF(s)</math>. (2M)</p> <p>2) <math>f(t) = 1 + e^t (\sin t + \cos t)</math></p> <p>Initial Value theorem state that <math>L[f(t)] = F(s)</math>, then <math>\lim_{t \rightarrow 0} f(t) = \lim_{s \rightarrow \infty} sF(s)</math>.</p> $L[f(t)] = L[1 + e^t (\sin t + \cos t)]$ $= \frac{1}{s} + \frac{1}{(s+1)^2 + 1} + \frac{s+1}{(s+1)^2 + 1}$ $LHS = \lim_{t \rightarrow 0} f(t) = 2.$ $RHS = \lim_{s \rightarrow \infty} \left[ 1 + \frac{s(s+2)}{(s+1)^2 + 1} \right] = 2 \quad (4M)$ <p><math>LHS = RHS</math></p> <p>Hence, Initial Value theorem verified.</p> <p>Final Value theorem state that <math>L[f(t)] = F(s)</math>, then <math>\lim_{t \rightarrow \infty} f(t) = \lim_{s \rightarrow 0} sF(s)</math>.</p>

	$LHS = \lim_{t \rightarrow \infty} f(t) = 1.$ $RHS = \lim_{s \rightarrow 0} \left[ 1 + \frac{s(s+2)}{(s+1)^2 + 1} \right] = 1$ (4M) $LHS = RHS$ <p>3) <u>Initial Value theorem Statement:</u> <math>L[f(t)] = F(s)</math>, then <math>\lim_{t \rightarrow 0} f(t) = \lim_{s \rightarrow \infty} sF(s)</math>.</p> $f(t) = e^{-t} \cos t$ $\lim_{t \rightarrow 0} f(t) = 1$ $\lim_{s \rightarrow \infty} sF(s) = 1$ (4M) Hence proved.
3	<p><b>Using convolution theorem find</b> <math>L^{-1}\left[\frac{1}{(s+a)(s+b)}\right]</math>. [APR/MAY 2011 R-13] (8M) BTL3</p> <p><b>Answer: Refer Page No:5.77-Dr. G. Balaji.</b></p> $\begin{aligned} L^{-1}\left[\frac{1}{(s+a)(s+b)}\right] &= L^{-1}\left[\left(\frac{1}{(s+a)}\right)\left(\frac{1}{(s+b)}\right)\right] \\ &= L^{-1}\left(\frac{1}{(s+a)}\right) * L^{-1}\left(\frac{1}{(s+b)}\right) \\ &= e^{-at} * e^{-bt} \quad (3M) \\ &= \int_0^t e^{-at} e^{-b(t-u)} du \\ &= e^{-bt} \left[ \frac{e^{-(a-b)u}}{-(a-b)} \right]_{u=0}^{u=t} \quad (3M) \\ &= \frac{e^{-bt} - e^{-at}}{a-b}. \quad (2M) \end{aligned}$ <p><u>Note:</u></p> <p><b>Using convolution theorem find</b> <math>L^{-1}\left[\frac{1}{(s+1)(s+2)}\right]</math>. [NOV/DEC 2007,2012 R-13] (8M)</p> <p><b>Hint:</b> In the above problem put <math>a = 2, b = 1</math>.</p>
4	<p><b>Find the Laplace inverse of</b> <math>\left[\frac{s^2}{(s^2 + a^2)^2}\right]</math> <b>using convolution theorem.</b> [NOV/DEC 2011 R-13] (8M) BTL3</p> <p><b>Answer: Refer Page No:5.84-Dr. G. Balaji.</b></p>

$$\begin{aligned}
L^{-1}\left[\frac{s^2}{(s^2+a^2)^2}\right] &= L^{-1}\left[\left(\frac{s}{(s^2+a^2)}\right)\left(\frac{s}{(s^2+a^2)}\right)\right] \\
&= L^{-1}\left(\frac{s}{(s^2+a^2)}\right) * L^{-1}\left(\frac{s}{(s^2+a^2)}\right) \\
&= \cos at * \cos at \quad (3M) \\
&= \int_0^t \cos au \cos a(t-u) du \\
&= \frac{1}{2} \int_0^t [\cos(au+at-au) + \cos(au-at+au)] du \quad (2M) \\
&= \frac{1}{2} \left[ (\cos at)u + \left[ \frac{\sin[2au-at]}{2a} \right] \right]_{u=0}^{u=t} \\
&= \frac{1}{2} \left[ t \cos at + \frac{\sin at}{a} \right] \\
L^{-1}\left[\frac{s^2}{(s^2+a^2)^2}\right] &= \frac{1}{2a} [\sin at + at \cos at]. \quad (3M)
\end{aligned}$$

Note:

**Using Convolution theorem, find  $L^{-1}\left[\frac{s^2}{(s^2+4)^2}\right]$ .** [NOV/DEC 2012 R-13] (8M)

**Hint:**

In the problem put  $a = 2$ .

5

**Using convolution theorem find  $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$ .** [NOV/DEC 2013, APR/MAY 2017 R-13] (8M) BTL3  
**Answer: Refer Page No:5.83-Dr. G. Balaji.**

	$  \begin{aligned}  L^{-1}\left[\frac{s}{(s^2 + a^2)^2}\right] &= L^{-1}\left[\left(\frac{s}{(s^2 + a^2)}\right)\left(\frac{1}{(s^2 + a^2)}\right)\right] \\  &= L^{-1}\left(\frac{s}{(s^2 + a^2)}\right) * \frac{1}{a} L^{-1}\left(\frac{a}{(s^2 + a^2)}\right) \\  &= \cos at * \frac{1}{a} \sin at \quad (3M) \\  &= \frac{1}{a} \int_0^t \cos au \sin a(t-u) du \\  &= \frac{1}{2a} \int_0^t [\sin(at - au + au) + \sin(at - au - au)] du \quad (2M) \\  &= \frac{1}{2a} \left[ (\sin at)u + \left[ \frac{-\cos[a(t-2u)]}{-2a} \right] \right]_0^t \\  &= \frac{1}{2a} \left[ t \sin at + \frac{\cos at}{2a} - \frac{\cos at}{2a} \right] \\  L^{-1}\left[\frac{s}{(s^2 + a^2)^2}\right] &= \frac{1}{2a} t \sin at. \quad (3M)  \end{aligned}  $
6	<p><b>Using convolution theorem find <math>L^{-1}\left[\frac{s}{(s^2 + a^2)(s^2 + b^2)}\right]</math>.</b> [MAY/JUNE 2016 R-13] (8M)BTL3</p> <p><b>Answer:</b> Refer Page No:5.81-Dr. G. Balaji.</p> $  \begin{aligned}  L^{-1}\left[\frac{s}{(s^2 + a^2)(s^2 + b^2)}\right] &= L^{-1}\left[\left(\frac{s}{(s^2 + a^2)}\right)\left(\frac{1}{(s^2 + b^2)}\right)\right] \\  &= L^{-1}\left(\frac{s}{(s^2 + a^2)}\right) * L^{-1}\left(\frac{1}{(s^2 + b^2)}\right) \\  &= \cos at * \frac{1}{b} \sin bt \quad (3M) \\  &= \frac{1}{b} \int_0^t \cos au \sin b(t-u) du \\  &= \frac{1}{2b} \int_0^t [\sin(au + bt - bu) + \sin(bt - bu - au)] du \quad (2M) \\  &= \frac{1}{2b} \left[ \left[ \frac{-\cos[(a-b)u + bt]}{a-b} \right] + \left[ \frac{-\cos[bt - (a+b)u]}{-(a+b)} \right] \right]_0^t \\  &= \frac{1}{2b} \left[ \cos at \left( \frac{1}{a+b} - \frac{1}{a-b} \right) - \cos bt \left( \frac{1}{a+b} - \frac{1}{a-b} \right) \right] \\  L^{-1}\left[\frac{s}{(s^2 + a^2)(s^2 + b^2)}\right] &= \frac{\cos at - \cos bt}{b^2 - a^2}. \quad (3M)  \end{aligned}  $ <p><b>Note:</b></p>

	<p><b>Using convolution theorem find</b> <math>L^{-1}\left[\frac{s}{(s^2+1)(s^2+4)}\right]</math>. [MAY/JUNE 2015,2016 R-13] (8M)</p> <p><b>Hint:</b></p> <p>In the above problem put <math>a = 1, b = 2</math>,</p> <p><b>Using convolution theorem find</b> <math>L^{-1}\left[\frac{s}{(s^2+4)(s^2+9)}\right]</math>. [MAY/JUNE 2015,2016 R-13] (8M)</p> <p><b>Hint:</b></p> <p>In the above problem put <math>= 2, b = 3</math>.</p>
	<p><b>Find</b> <math>L^{-1}\left[\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right]</math> <b>using convolution theorem.</b> [APR/MAY 2014, 2015,2016, NOV/DEC 2014, 2016 R-13] (8M) BTL3</p> <p><b>Answer:</b> Refer Page No:5.86-Dr. G. Balaji.</p> $  \begin{aligned}  L^{-1}\left[\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right] &= L^{-1}\left[\left(\frac{s}{(s^2+a^2)}\right)\left(\frac{s}{(s^2+b^2)}\right)\right] \\  &= L^{-1}\left(\frac{s}{(s^2+a^2)}\right) * L^{-1}\left(\frac{s}{(s^2+b^2)}\right) \\  &= \cos at * \cos bt \quad (3M) \\  &= \int_0^t \cos au \cos b(t-u) du \\  7 \quad &= \frac{1}{2} \int_0^t [\cos(au+bt-bu) + \cos(au-bt+bu)] du \quad (2M) \\  &= \frac{1}{2} \left[ \left[ \frac{\sin((a-b)u+bt)}{a-b} \right] + \left[ \frac{\sin((a+b)u-bt)}{a+b} \right] \right]_0^t \\  &= \frac{1}{2} \left[ \sin at \left( \frac{1}{a-b} + \frac{1}{a+b} \right) + \sin bt \left( \frac{1}{a+b} - \frac{1}{a-b} \right) \right] \\  &L^{-1}\left[\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right] = \frac{a \sin at - b \sin bt}{a^2 - b^2}. \quad (3M)  \end{aligned}  $ <p><b>Note:</b></p> <p><b>Find</b> <math>L^{-1}\left[\frac{s^2}{(s^2+1)(s^2+4)}\right]</math> <b>using convolution theorem.</b> [APR/MAY 2017 R-13] (8M)</p> <p><b>Hint:</b> In the above problem put <math>a = 1 &amp; b = 2</math>.</p>
8	<p><b>Find the Laplace transform of the rectangular wave given by</b> <math>f(t) = \begin{cases} k &amp; , 0 &lt; t &lt; b \\ -k &amp; , b &lt; t &lt; 2b \end{cases}</math>.</p> <p>[APR/MAY 2008, 2015 R-13] (8M) BTL5</p>

**Answer: Refer Page No:5.92-Dr. G. Balaji.**

$$\text{Given, } f(t) = \begin{cases} k & , 0 < t < b \\ -k & , b < t < 2b \end{cases}.$$

This function is periodic in the interval  $(0, 2b)$  with period  $2b$ .

$$\begin{aligned} L[f(t)] &= \frac{1}{1-e^{-ps}} \int_0^p e^{-st} f(t) dt \\ L[f(t)] &= \frac{1}{1-e^{-2bs}} \int_0^{2b} e^{-st} f(t) dt \\ &= \frac{1}{1-e^{-2bs}} \left[ \int_0^b e^{-st} (k) dt + \int_b^{2b} e^{-st} (-k) dt \right] \quad (2M) \\ &= \frac{k}{1-e^{-2bs}} \left[ \left[ \frac{e^{-st}}{-s} \right]_0^b - \left[ \frac{e^{-st}}{-s} \right]_b^{2b} \right] \quad (2M) \\ &= \frac{k}{s} \frac{1}{1-e^{-2bs}} [1 - 2e^{-bs} + e^{-2bs}] \\ &= \frac{k}{s} \frac{[1-e^{-bs}]^2}{(1-e^{-bs})(1+e^{-bs})} \quad (2M) \\ &= \frac{k}{s} \tanh \left[ \frac{bs}{2} \right] \quad (2M) \end{aligned}$$

Note:

**Find the Laplace transform of the rectangular wave given by**  $f(t) = \begin{cases} 1 & , 0 < t < b \\ -1 & , b < t < 2b \end{cases}.$

**[APR/MAY 2013, 2014 R-13] (8M)**

**Hint:** In the above problem put  $k = 1$ .

**Find the Laplace transform of the rectangular wave given by**  $f(t) = \begin{cases} E & , 0 < t < a \\ -E & , a < t < 2a \end{cases}$  **for all**

$f(t + 2a) = f(t)$  **[NOV/DEC 2010 R-13] (8M)**

**Hint:** In that above solved problem put  $k = E$  and  $b = a$ .

**Find the Laplace transform of a square wave function given by**

$$f(t) = \begin{cases} E & \text{for } 0 \leq t \leq a/2 \\ -E & \text{for } a/2 \leq t \leq a \end{cases} \text{ and } f(t+a) = f(t). \text{ [NOV/DEC 2011, 2016, MAY/JUNE 2016 R-13] (8M) BTL5}$$

**Answer: Refer Page No:5.95-Dr. G. Balaji.**

	$L[f(t)] = \frac{1}{1-e^{-ps}} \int_0^p e^{-st} f(t) dt$ $L[f(t)] = \frac{1}{1-e^{-as}} \int_0^a e^{-st} f(t) dt$ $= \frac{1}{1-e^{-as}} \left[ \int_0^{a/2} e^{-st} (E) dt + \int_{a/2}^a e^{-st} (-E) dt \right] \quad (2M)$ $= \frac{E}{1-e^{-as}} \left[ \left[ \frac{e^{-st}}{-s} \right]_0^{a/2} - \left[ \frac{e^{-st}}{-s} \right]_{a/2}^a \right] \quad (2M)$ $= \frac{E}{s} \frac{1}{1-e^{-as}} \left[ 1 - 2e^{-as/2} + e^{-sa} \right]$ $= \frac{E}{s} \frac{\left[ 1 - e^{-as/2} \right]^2}{\left( 1 - e^{-as/2} \right) \left( 1 + e^{-as/2} \right)} \quad (2M)$ $= \frac{E}{s} \tanh \left[ \frac{as}{4} \right] \quad (2M)$
	<p><b>Find the Laplace Transform of triangular wave function</b> <math>\begin{cases} t &amp; , \quad 0 &lt; t &lt; a \\ 2a-t &amp; , \quad a &lt; t &lt; 2a \end{cases}</math> <b>with</b>  <math>f(t+2a) = f(t)</math>. [APR/MAY 2000, 2008, 2015, 2016, MAY/JUNE 2006, 2009, 2012, NOV/DEC 2005, 2009, 2014 R-13] (8M) BTL5</p> <p><b>Answer:</b> Refer Page No:5.94-Dr. G. Balaji.</p>
10	$L[f(t)] = \frac{1}{1-e^{-2as}} \int_0^{2a} e^{-st} f(t) dt$ $= \frac{1}{1-e^{-2as}} \left[ \int_0^a e^{-st} t dt + \int_a^{2a} e^{-st} (2a-t) dt \right] \quad (2M)$ $L[f(t)] = \frac{1}{1-e^{-2as}} \left[ \frac{-ae^{-as}}{s} - \frac{e^{-as}}{s^2} + \frac{1}{s^2} + \frac{ae^{-as}}{s} + \frac{e^{-2as}}{s^2} - \frac{e^{-as}}{s^2} \right] \quad (3M)$ $L[f(t)] = \frac{1}{1-e^{-2as}} \left[ \frac{1-2e^{-as}+e^{-2as}}{s^2} \right]$ $= \frac{1}{s^2} \frac{(1-e^{-as})^2}{(1-e^{-as})(1+e^{-as})}$ $= \frac{1}{s^2} \frac{(1-e^{-as})}{(1+e^{-as})}.$ $= \frac{1}{s^2} \tanh \left[ \frac{as}{2} \right]. \quad (3M)$
11	Using Laplace transform technique, solve $y'' + y' = t^2 + 2t$ , given $y = 4, y' = -2$

	<p><b>when <math>t = 0</math>. [NOV/DEC 2013, MAY/JUNE 2016 R-13] (8M)BTL 3</b></p> <p><b>Answer: Refer Page No:5.109-Dr. G. Balaji.</b></p> <p>Given: <math>y'' + y' = t^2 + 2t</math>, <math>y = 4</math>, <math>y' = -2</math> when <math>t = 0</math>,</p> $L[y''(t)] + L[y'(t)] = L[t^2] + 2L[t]$ $s^2 L[y(t)] - sy(0) - y'(0) + sL[y(t)] - y(0) = \frac{2}{s^3} + 2 \frac{1}{s^2} \quad (2M)$ $(s^2 + s)L[y(t)] = 4s + 2 + \frac{2 + 2s}{s^3} = \frac{4s^4 + 2s^3 + 2 + 2s}{s^3}$ $L[y(t)] = \frac{4s^4 + 2s^3 + 2 + 2s}{s^3(s^2 + s)}$ $L[y(t)] = \frac{4}{s+1} + \frac{2}{s(s+1)} + \frac{2}{s^4} \quad (3M)$ $L[y(t)] = \frac{2}{s} + \frac{2}{s+1} + \frac{2}{s^4}$ $y(t) = 2L^{-1}\left[\frac{1}{s}\right] + 2L^{-1}\left[\frac{1}{s+1}\right] + 2L^{-1}\left[\frac{1}{s^4}\right]$ $y(t) = 2 + 2e^{-t} + \frac{1}{3}t^3. \quad (3M)$
12	<p><b>Solve <math>\frac{d^2y}{dt^2} + 4y = \sin 2t</math>, given <math>y(0) = 3</math>, and <math>y'(0) = 4</math>. [MAY/JUNE 2014 R-13] (8M)BTL 3</b></p> <p><b>Answer: Refer Page No:5.106-Dr. G. Balaji.</b></p> <p>Given: <math>\frac{d^2y}{dt^2} + 4y = \sin 2t</math>, <math>y(0) = 3</math>, and <math>y'(0) = 4</math>.</p> $L[y''(t)] + 4L[y(t)] = L[\sin 2t]$ $[s^2 L[y(t)] - sy(0) - y'(0)] + 4L[y(t)] = \frac{2}{s^2 + 4}$ $[s^2 + 4]L[y(t)] = \frac{2}{s^2 + 4} + 3s + 4 \quad (3M)$ $L[y(t)] = \frac{2}{(s^2 + 4)^2} + \frac{3s}{s^2 + 4} + \frac{4}{s^2 + 4}$ $y(t) = \frac{2}{8} L^{-1}\left[\frac{(s^2 + 2^2) - (s^2 - 2^2)}{(s^2 + 2^2)^2}\right] + 3\cos 2t + \frac{4}{2} \sin 2t. \quad (3M)$ $y(t) = \frac{1}{8} \sin 2t - \frac{1}{4} t \cos 2t + 3\cos 2t + 2\sin 2t. \quad (2M)$
13	<p><b>Solve <math>\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 2</math> given <math>x = 0</math> and <math>\frac{dx}{dt} = 5</math> for <math>t = 0</math> using Laplace transform method. [APR/MAY 2011, NOV/ DEC 2012 R-13] (8M)BTL 3</b></p> <p><b>Answer: Refer Page No:5.100-Dr. G. Balaji.</b></p> <p>Given: <math>\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 2</math> given <math>x = 0</math> and <math>\frac{dx}{dt} = 5</math> for <math>t = 0</math>.</p>

	$L[x''(t)] - 3L[x'(t)] + 2L[x(t)] = L[2]$ $[s^2 L[x(t)] - sx(0) - x'(0)] - 3[sL[x(t)] - x(0)] + 2L[x(t)] = 2L[1]$ $[s^2 - 3s + 2]L[x(t)] = \frac{2}{s} + 5$ $L[x(t)] = \frac{2+5s}{s(s^2-3s+2)} \quad (2M)$ $L[x(t)] = \frac{1}{s} + \frac{(-7)}{s-1} + \frac{6}{(s-2)}$ $x(t) = L^{-1}\left[\frac{1}{s}\right] - 7L^{-1}\left[\frac{1}{s-1}\right] + 6L^{-1}\left[\frac{1}{(s-2)}\right] \quad (3M)$ $x(t) = 1 - 7e^t + 6e^{2t} \quad (3M)$
	<p><b>Solve using Laplace transform, <math>x'' - 2x' + x = e^t</math> when <math>x(0) = 2, x'(0) = -1</math>. [NOV/DEC 2015, APRIL 2017 R-13] (8M).BTL 3</b></p> <p><b>Answer: Refer Page No:5.103-Dr. G. Balaji.</b></p> <p>Given:</p> $x''(t) - 2x'(t) + x(t) = e^t$ $x(0) = 2; x'(0) = -1$ $[s^2 L[x(t)] - sx(0) - x'(0)] - 2[sL[x(t)] - x(0)] + L[x(t)] = L(e^t)$
14	$L[x(t)](s-1)^2 = \frac{1}{s-1} + 2s - 2 - 3. \quad (3M)$ $L[x(t)] = \frac{1}{(s-1)^3} + \frac{2(s-1)}{(s-1)^2} - \frac{3}{(s-1)^2}$ $x(t) = L^{-1}\left[\frac{1}{(s-1)^3}\right] + 2L^{-1}\left[\frac{1}{(s-1)^2}\right] - 3L^{-1}\left[\frac{1}{(s-1)^2}\right]$ $= e^t \frac{t^2}{2} + 2e^t - 3e^t t \quad (5M)$
15	<p><b>Solve by using L.T(<math>D^2 + 9</math>)<math>y = \cos 2t</math>, given that if <math>y(0) = 1, y\left(\frac{\pi}{2}\right) = -1</math>. [NOV/DEC 2004, MAY/JUNE 2009, APR/MAY 2015, DEC/JAN 2016 R-13] (8M)BTL 3</b></p> <p><b>Answer: Refer Page No: 5.99-Dr. G. Balaji.</b></p> <p>Given:</p> $(D^2 + 9)y = \cos 2t.$ $y''(t) + 9y(t) = \cos 2t.$ $L(y''(t)) + 9L(y(t)) = L(\cos 2t).$ $[s^2 L[y(t)] - sy(0) - y'(0)] + 9L[y(t)] = \frac{s}{s^2 + 4}. \quad (2M)$ $(s^2 + 9)L[y(t)] = \frac{s}{s^2 + 4} + s + k.$ $L[y(t)] = \frac{s}{(s^2 + 4)((s^2 + 9)} + \frac{s+k}{(s^2 + 9)}.$ $L[y(t)] = \frac{1}{5} \frac{s}{s^2 + 4} + \frac{4}{5} \frac{s}{s^2 + 9} + \frac{k}{s^2 + 9} \quad (2M)$

	$y(t) = \frac{1}{5} \cos 2t + \frac{4}{5} \cos 3t + \frac{k}{3} \sin 3t. \quad (2M)$ $\therefore y\left(\frac{\pi}{2}\right) = -1$ $\therefore y\left(\frac{\pi}{2}\right) = \frac{1}{5} \cos 2\left(\frac{\pi}{2}\right) + \frac{4}{5} \cos 3\left(\frac{\pi}{2}\right) + \frac{k}{3} \sin 3\left(\frac{\pi}{2}\right) = -1$ $k = \frac{12}{5}.$ $y(t) = \frac{1}{5} \cos 2t + \frac{4}{5} \cos 3t + \frac{4}{5} \sin 3t. \quad (2M)$
16	<p><b>Find the Laplace transform of the Half-sine wave rectifier function given by</b></p> $f(t) = \begin{cases} \sin \omega t & \text{for } 0 \leq t \leq \frac{\pi}{\omega} \\ 0 & \text{for } \frac{\pi}{\omega} \leq t \leq \frac{2\pi}{\omega} \end{cases}. \quad [\text{NOV/DEC 2012, 2016, 2019 MAY/JUNE 2017, 2019}]$ <p><b>R-13] (8M) BTL5</b></p> <p><b>Answer: Refer Page No: 5.95-Dr. G. Balaji.</b></p> $L[f(t)] = \frac{1}{1-e^{-ps}} \int_0^p e^{-st} f(t) dt$ $L[f(t)] = \frac{1}{1-e^{-as}} \int_0^{2\pi/\omega} e^{-st} f(t) dt$ $= \frac{1}{1-e^{-2\pi/\omega s}} \left[ \int_0^{\pi/\omega} e^{-st} (\sin \omega t) dt + \int_{\pi/\omega}^{2\pi/\omega} e^{-st} (0) dt \right] \quad (2M)$ $= \frac{1}{1-e^{-2\pi/\omega s}} \left[ \frac{e^{-st}}{s^2 + \omega^2} [-s \sin \omega t - \omega \cos \omega t] \Big _0^{\pi/\omega} \right] \quad (2M)$ $= \frac{1}{1-e^{-2\pi/\omega s}} \left[ \frac{e^{-st} \omega + \omega}{s^2 + \omega^2} \right]$ $= \frac{\omega}{[1-e^{-\pi/\omega s}][s^2 + \omega^2]} \quad (2M)$

<b>IT8201</b>	<b>INFORMATION TECHNOLOGY ESSENTIALS</b>	<b>L T P C 3 0 0 3</b>
<b>OBJECTIVES:</b> • To introduce the concept of Internet, Networks and its working principles.		
• To know scripting languages. • To understand various applications related to Information Technology.		
<b>UNIT I WEB ESSENTIALS</b>		
Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server		
<b>UNIT II SCRIPTING ESSENTIALS</b>		
Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts		
<b>UNIT III NETWORKING ESSENTIALS</b>		
Fundamental computer network concepts - Types of computer networks - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components		
<b>UNIT IV MOBILE COMMUNICATION ESSENTIALS</b>		
Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS		
<b>UNIT V APPLICATION ESSENTIALS</b>		
Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications		
<b>TOTAL: 45 PERIODS</b>		
<b>OUTCOMES:</b> On Completion of the course, the students should be able to:		

- Design and deploy web-sites
- Design and deploy simple web-applications
- Create simple database applications
- Develop information system
- Describe the basics of networking and mobile communications

**TEXT BOOKS:** 1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.

2. James F. Kurose, —Computer Networking: A Top-Down Approach, Sixth Edition, Pearson, 2012.

**REFERENCES:** 1. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.

2. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.
3. it-ebooks.org

**Subject Code:** IT8201

**Subject Name:** INFORMATION TECHNOLOGY ESSENTIALS

**Year/Semester:** I / 02

**Subject Handler:** Mr. N. Prabhakaran

## **UNIT I - WEB ESSENTIALS**

**Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server**

### **PART \*A**

<b>Q.N O</b>	<b>QUESTIONS</b>
1.	<b>What is an HTML? BTL1</b> <ul style="list-style-type: none"><li>• HTML stands for Hyper Text Markup Language</li><li>• An HTML file is a text file containing small markup tags</li><li>• The markup tags tell the Web browser how to display the page</li><li>• An HTML file must have an html or html file extension</li></ul>
2.	<b>What are the limitations of HTML?BTL1</b> <ul style="list-style-type: none"><li>• HTML is also known as Hypertext Markup Language provides the creation of the web pages.</li><li>• The HTML pages are the documents that can be read by the server, and are not the best fit to be read by humans.</li><li>• HTML forms have the dependency on scripting languages and it results in complex document creation that consumes more time.</li><li>• HTML doesn't initialize the form data properly and doesn't make it easier for the users to enter the information once.</li><li>• HTML having some limitations with the use of forms that doesn't allow encoding formats, url encoded or multipart forms.</li></ul>
3.	<b>What are the components of a website?BTL1</b> <p>Web Components are a set of features currently being added by the W3C to the HTML and DOM specifications that allow for the creation of reusable widgets or components in web documents and web applications. The intention behind them is to bring component-based software engineering to the World Wide Web.</p>
4.	<b>State the elements of a webpage.BTL2</b> <p>The web page is what displays, but the term also refers to a computer file, usually written in HTML or comparable markup language. Web browsers coordinate the various web resource elements for the written web page, such as style sheets, scripts, and images, to present the webpage.</p>
5.	<b>What are the different parts of web address?BTL1</b> <p>The first part of the URL is called a protocol identifier and it indicates what protocol to use, and the second part is called a resource name and it specifies the IP address or the domain name where the resource is located.</p>

6.	<p><b>Define URL. BTL2</b></p> <p>URL is the abbreviation of Uniform Resource Locator and is defined as the global address of documents and other resources on the World Wide Web. A URL is one type of Uniform Resource Identifier (URI); the generic term for all types of names and addresses that refer to objects on the World Wide Web.</p>
7.	<p><b>What is the WWW in a web address? BTL1</b></p> <p>A Uniform Resource Locator (URL), colloquially termed a web address, is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it. A URL is a specific type of Uniform Resource Identifier (URI), although many people use the two terms interchangeably.</p>
8.	<p><b>What is a web authoring tool? BTL1</b></p> <p>Web authoring tools are used to create Web content, and cover a wide range of software programs you can download to your computer or access online. The World Wide Web Consortium, or W3, issues guidelines for web authoring tools that create a basic industry standard for web accessibility.</p>
9.	<p><b>Difference between web server and application server. BTL2</b></p> <p>A Web server can be either a computer program or a computer running a program that is responsible for accepting HTTP requests from clients, serving back HTTP responses along with optional data contents, which usually are web pages such as HTML documents and linked objects on it. An application server is the kind of software engine that will deliver various applications to another device. It is the kind of computer found in an office or university network that allows everyone in the network to run software off of the same machine.</p>
10.	<p><b>What is a Web Server?BTL1</b></p> <p>Web servers use HTTP to allow access to the Internet. They search through and use HTML files that are sent to web browsers and translated so the user can understand them. It is also capable of accessing and storing other types of files, but they are often attached in some way to the HTML files it has, such as having images that are placed upon the HTML.</p>
11.	<p><b>What are Web Servers Used For?BTL2</b></p> <p>Web servers are primarily used to store process and deliver the pages of a web site to users. In layman's terms, this means that web servers are what make websites appear when you type in a URL.</p>
12.	<p><b>What is application server?BTL1</b></p> <p>This is a server that is dedicated to serving a certain piece of software. It is often used in conjunction with other servers and software. For example, you may sign up for online gaming and be directed to servers set up solely for the gaming software.</p>
13.	<p><b>State the advantages of application server.BTL2</b></p> <ul style="list-style-type: none"> <li>• Data and Code Integrity Centralized Configuration</li> <li>• Security</li> <li>• Performance</li> <li>• Lower Cost of Ownership</li> </ul>

	<ul style="list-style-type: none"> <li>• Transaction Support</li> </ul>
14.	<p><b>List the types of application server.BTL3</b></p> <ul style="list-style-type: none"> <li>• Java Application Servers</li> <li>• .Net Framework</li> <li>• PHP Application Servers</li> <li>• Open Source Application Servers</li> <li>• Mobile Application Servers</li> </ul>
15.	<p><b>What is a social network?BTL1</b></p> <p>A social networking service (also social networking site, SNS or social media) is an online platform that people use to build social networks or social relations with other people who share similar personal or career interests, activities, backgrounds or real-life connections.</p>
16.	<p><b>List few examples of web browser.BTL3</b></p> <p>The most popular web browsers that are used today are</p> <ul style="list-style-type: none"> <li>• Mozilla Firefox</li> <li>• Google Chrome</li> <li>• Microsoft Internet Explorer</li> <li>• Apple</li> <li>• Opera browser</li> </ul>
17	<p><b>Difference between browser and search engine.BTL2</b></p> <p>There are many browsers such as Internet Explorer, Firefox, Safari, and Opera, etc. A browser is used to access various websites and web pages. A search engine is also a software program that searches for some particular document when specific keywords are entered. Google and Yahoo are the most popular search engines.</p>
18.	<p><b>What is the difference between browser and a server?BTL2</b></p> <p>A web server is a program on a server computer, somewhere out on the Internet that delivers web pages to web browsers. The term web server also refers to an actual, physical computer that is running web server software.</p>
19.	<p><b>Define web browser.BTL2</b></p> <p>Web Browser is application software that allows us to view and explore information on the web. User can request for any web page by just entering a URL into address bar. Web browser can show text, audio, video, animation and more</p>
20.	<p><b>What is web server?BTL1</b></p> <p>Web server is a program that uses HTTP to serve files that create web pages to users in response to their requests, which are forwarded by their computers HTTP requests.</p>
21	<p><b>List some describe features of authoring tools.BTL3</b></p>

	<ul style="list-style-type: none"> <li>• Programming features * Interactivity features</li>   <li>• Editing and organizing features</li> <li>• Delivery features</li> <li>• Cross platform features</li> </ul>																									
22.	<p><b>What is authoring tool? BTL1</b></p> <p>Authoring tool is a software packages which developers use to create and package e-learning content deliverables to end users. The multimedia authoring tools provide the capability for creating a complete multimedia presentation, including interactive user control.</p>																									
23.	<p><b>What is a cache control feature of HTTP? BTL1</b></p> <p>This is an advanced feature of HTTP. Most of the web browsers automatically store (cache) the recently visited web pages . This is very useful feature because if the user requests the same web page that has been visited already then it can be displayed from the cache memory instead of requesting the web server and bringing it from there.</p>																									
<b>PART * B</b>																										
1.	<p><b>Explain briefly about to the Creating Web Site.BTL2</b></p> <p>Definition of website:</p> <p>Why do people visit website? Steps for creating the Website:</p> <p>Step 1: Website creation: Step 2: Choosing the web hosting services Step 3: Registering Domain Name Step 4: Planning your website Step 5: Uploading Files Testing the website</p> <ul style="list-style-type: none"> <li>• Multiple Browsers</li> <li>• Multiple Operating Systems</li> <li>• Connection Speed</li> <li>• Device Types:</li> <li>• Links</li> </ul> <p>Security</p>																									
2.	<p><b>Write the working principle of IP Addressing BTL2</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 10%;">A</td> <td style="width: 10%; text-align: center;">8 bits</td> <td style="width: 10%; text-align: center;">Network</td> <td style="width: 10%; text-align: center;">Host</td> <td style="width: 10%; text-align: center;">1.0.0.0 to 127.255.255.255</td> </tr> <tr> <td>B</td> <td style="text-align: center;">16 bits</td> <td>Network</td> <td>Host</td> <td>128.0.0.0 to 191.255.255.255</td> </tr> <tr> <td>C</td> <td style="text-align: center;">24 bits</td> <td>Network</td> <td>Host</td> <td>192.0.0.0 to 223.255.255.255</td> </tr> <tr> <td>D</td> <td>1110</td> <td>Multicast address</td> <td></td> <td>224.0.0.0 to 239.255.255.255</td> </tr> <tr> <td>E</td> <td>1111</td> <td>Reserved for future use</td> <td></td> <td>240.0.0.0 to 255.255.255.255</td> </tr> </tbody> </table>	A	8 bits	Network	Host	1.0.0.0 to 127.255.255.255	B	16 bits	Network	Host	128.0.0.0 to 191.255.255.255	C	24 bits	Network	Host	192.0.0.0 to 223.255.255.255	D	1110	Multicast address		224.0.0.0 to 239.255.255.255	E	1111	Reserved for future use		240.0.0.0 to 255.255.255.255
A	8 bits	Network	Host	1.0.0.0 to 127.255.255.255																						
B	16 bits	Network	Host	128.0.0.0 to 191.255.255.255																						
C	24 bits	Network	Host	192.0.0.0 to 223.255.255.255																						
D	1110	Multicast address		224.0.0.0 to 239.255.255.255																						
E	1111	Reserved for future use		240.0.0.0 to 255.255.255.255																						

3.	<p><b>Write the working principle of DNS BTL2</b></p> <p>It is very difficult to remember numerical information but it is simple to remember the textual information. Consider that we want to access Priyanka's PC, then accessing it using the IP address www. 192.168.0.101 is definitely not comfortable, rather if we have the address www.priyanka@technical.com then accessing and remembering Priyanka's PC address is very simple. The names which are used to identify computer within a network are called domain names.</p> <table> <thead> <tr> <th>Domain Names</th> <th>Purpose</th> </tr> </thead> <tbody> <tr> <td>Com</td> <td>Commercial organization</td> </tr> <tr> <td>Gov</td> <td>Government organization</td> </tr> <tr> <td>Edu</td> <td>Educational institutions</td> </tr> <tr> <td>Int</td> <td>International organization</td> </tr> <tr> <td>Net</td> <td>Network group</td> </tr> <tr> <td>Org</td> <td>Non profit organization</td> </tr> <tr> <td>Mil</td> <td>Military organization</td> </tr> <tr> <td>In</td> <td>Sub domain name used to refer India</td> </tr> <tr> <td>UK</td> <td>Sub domain name used to refer uk</td> </tr> <tr> <td>Jp</td> <td>Sub domain name used to refer japan</td> </tr> </tbody> </table> <p><b>Working of DNS</b></p> <p>There are two tasks that can be carried out by DNS servers:</p> <ul style="list-style-type: none"> <li>• Accepting and then requesting the programs to convert domain names to IP address.</li> <li>• Accepting and then requesting the other DNS servers to convert domain names to IP address.</li> </ul>	Domain Names	Purpose	Com	Commercial organization	Gov	Government organization	Edu	Educational institutions	Int	International organization	Net	Network group	Org	Non profit organization	Mil	Military organization	In	Sub domain name used to refer India	UK	Sub domain name used to refer uk	Jp	Sub domain name used to refer japan
Domain Names	Purpose																						
Com	Commercial organization																						
Gov	Government organization																						
Edu	Educational institutions																						
Int	International organization																						
Net	Network group																						
Org	Non profit organization																						
Mil	Military organization																						
In	Sub domain name used to refer India																						
UK	Sub domain name used to refer uk																						
Jp	Sub domain name used to refer japan																						
4.	<p><b>Write short notes on URL BTL2</b></p> <p>The Uniform Resource Locator (URL) is unique address for the file that has to be accessed over the internet. The URL contains names of the protocol such as http://. The URL contain the names of the protocol such as ftp. For example : <a href="ftp://ftp.funet.fi/pub/standards/RFC/rfc2166.txt">ftp://ftp.funet.fi/pub/standards/RFC/rfc2166.txt</a> The protocol identifier and the resource name are separated by a colon and two forward slashes. The syntax of writing URL is given below: protocol://username@hostname/path/filename. Sometimes instead of domain name servers IP addresses can also be used, for example <a href="http://192.168.0.1">http://192.168.0.1</a>. But use of IP address as URL is not preferred because human cannot remember numbers very easily but they can remember names easily.</p> <p><b>Absolute and Relative URL</b></p> <ul style="list-style-type: none"> <li>• The absolute URL is a URL which directly point to a file. It exactly specifies exact location of a file or directory on the internet . Each absolute URL is unique.</li> </ul> <p>For example: <a href="http://www.vtubooks.com/home.aspx">http://www.vtubooks.com/home.aspx</a></p> <ul style="list-style-type: none"> <li>• The relative URL points to the file or a directory in relation to the present directory. For example: <a href="http://www.webie.com/myphotos/mother.jpg">http://www.webie.com/myphotos/mother.jpg</a></li> </ul>																						
5.	<p><b>Write down the Working Principle Of A Website Design and Issues BTL2</b></p>																						

	<ul style="list-style-type: none"> <li>• Quality of Web content</li> <li>• Clear, User-friendly navigation</li> <li>• Simple and professional design</li> <li>• Webpage speed</li> <li>• Search Engine optimization</li> <li>• Web compatibility</li> <li>• Simplicity</li> <li>• Identity</li> <li>• Consistency</li> <li>• Robustness</li> <li>• Navigability</li> <li>• Visual Appeal</li> </ul> <p><b>Compatibility</b></p>
6.	<p><b>Explain in details about the different Phases Of Website Development BTL2</b></p> <p>Web project can be designed in the four phases as given below - Phase</p> <p>I: Strategy</p> <p>Phase II: Design Phase III: Production</p> <p>Phase IV: Testing</p> <pre> graph TD     subgraph Project_Planning [Project planning]         direction TB         S[Strategy] --&gt; GO[Goals and Objective Focus groups Market research]         D[Design] --&gt; CD[Concept development Creative Design Technical Design]     end     subgraph Project_Implementation [Project Implementation]         direction TB         P[Production] --&gt; TP[Test plan]         T[Testing] --&gt; PG[Production guide Test Results]     end     GO --&gt; FS[Functional Specification Prototype Projection]     CD --&gt; TP     PG --&gt; TS[Test Results]   </pre>
	<p><b>Enhancing Website</b></p> <p>There are varieties of ways by which one can enhance his website. The website can be enhanced using some key elements such as -</p> <ul style="list-style-type: none"> <li>• Contents</li> <li>• Graphics</li> <li>• Color and Text</li> <li>• Flash</li> <li>• Frames.Organizing Files</li> </ul>
	<p><b>Part * C</b></p>
1	<p><b>Explain in details about the browser fundamentals and working principles BTL2</b></p> <p><b>Web browser</b> is a kind of software which is basically used to use resources on the web.</p> <ul style="list-style-type: none"> <li>• Over the networks, two computers communicate with each other. In this communication, when request is made by one computer then that computer is called a <b>client</b> and when the request gets served by another computer then that computer is</li> </ul>

called **server**. Thus exchange of information takes place via client-Server communication.

- When user wants some web document then he makes the request for it using the web browser. The browsers are the programs that are running on the client's machines. The request then gets served by the server and the requested page is then returned to the client. It is getting displayed to the client on the web browser. The web browser can browse the information on the server and hence is the name.

Various web browsers that are commonly used are

Browser	Vendor
Internet Explorer	Microsoft
Google Chrome	Google
Mozilla Firefox	Mozilla
Netscape Navigator	Netscape Communications Corp
Opera	Opera Software
Safari	Apple

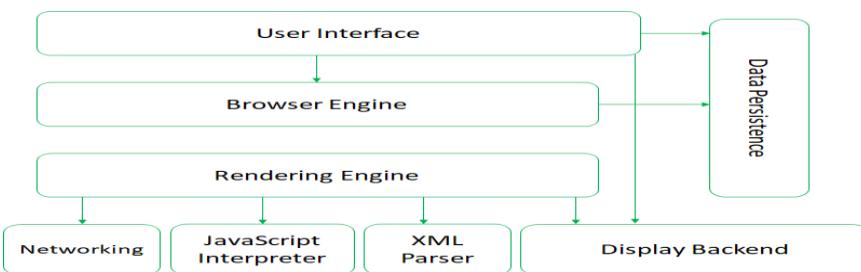
### Functions Defined by Web Browser

Various functions of web browser are -

- i. Reformat the URL and send a valid HTTP request.
- ii. When user gives the address of particular website it is in the form of domain name. The web browser converts the DNS to corresponding IP address.
- iii. The web browser establishes a TCP connection with the Web browser while processing the user's request.
- iv. The web browser sends the HTTP request to the web server.
- v. The web server processes the HTTP request sent by the web browser and returns the desired web page to the client machine. The web browser on the client's machine displays this webpage in appropriate format.

### Web Browser Architecture

The web browser architecture is represented by following figure



The main components of web browser architecture are as follows -

#### User Interface:

**Browser Engine:**

**Rendering Engine:**

**Networking:**

**JavaScript Interpreter:**

**User Interface Backend:**

**Data Persistence:**

**Working of Web Browser**

### **Step 1:**

First user types the website address for demanding the desired web page for example -

**http://www.vtubooks.com/home.aspx**

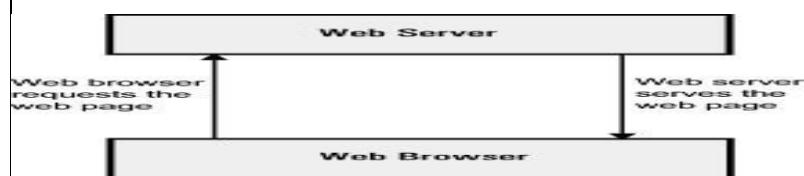
and then the home page of this website appears on the screen.

- The web address is divided into three parts:
  - (i) The first part is the protocol. The **http** is a hypertext transfer protocol which tells the web browser that user wishes to communicate with web server on **port 80**. Port 80 is reserved for the communication between web server and web browser.
  - The second part is the server address. This tells the web browser which server it needs to contact in order to retrieve the information you are looking for. The web browser communicates with a **Domain Name Server (DNS)** to find out the IP Address for the website. All communications on the internet use IP Addresses for communications. Use of the numeric address for accessing the web server is avoided because it is easier to remember textual information than that of numeric one. Hence normally the web server's addresses are textual.
  - The third part of this address donates the resource user wants to see.

### **Step 2:**

The web browser, on locating the IP Address which it requires (by communicating with the name server), send a request directly to the web server, using port 80, asking for the file **home.aspx**. **Step 3:**

The web server sends the html for this page back to user's web browser. If there are additional files needed in order to show the web page (like some images for example) the web browser makes additional requests for each of these



### **Basic features of Web Browsers**

1. Web browsers should be able to look at the web pages throughout internet or connect to various sites to access information.
2. The Web browser must enable you to follow the hyperlinks on a Web and type in a URL for it to follow. One of the main features of a browser is to search the information on the current page as well as search the WWW itself.
3. Browser give you the facility to save a web page in a file on your computer, print a Web page and send the contents of a Web page e-Mail to others on the internet.
4. Web browser should be able to handle text, images of the World Wide Web, as well as the hyperlinks to digital video, or other types of information.
5. Web browsers interact not just with the Web, but also with your computer's operating

	<p>system and with other programs, called plug-ins that gives the browser enhanced features.</p> <ol style="list-style-type: none"> <li>6. Another important features to insist on in your browser is <b>caching</b>. A browser that caches keeps of the pages you visit so that it does not have to download them again if you want to return to them. Reloading a page from the cache is much quicker than downloading it again from the original source.</li> <li>7. The most important feature of any browser is ease of use. While all Web browsers are fundamentally simple to use, it makes user comfortable.</li> </ol>																				
2	<p><b>Write down the working principles of HTTP Protocol BTL2</b></p> <ul style="list-style-type: none"> <li>• <b>Hyper Text Transfer Protocol (HTTP)</b> takes part in web browser and web server communication. Hence it is called a <b>Communication protocol</b>. The basic features of HTTP protocol are that it follows the <b>request response model</b>. The client makes a request for desired web page by giving the URL in the address bar. This request is submitted to the web server and then web server gives response to the web browser by returning the required web page.</li> </ul> <p><b>HTTP Request Message Structure</b></p> <p>The basic structure of request message is given by following general form -</p> <p>&lt;start line&gt;  &lt;Header fields&gt;  &lt;Blank Line&gt;  &lt;Message Body&gt;</p> <p>Let us discuss this structure in detail:</p> <p><b>Start line</b></p> <p>The <b>start line</b> consist of three parts which are separated by a single space. These parts are -  1) Request method 2) Request-URI 3) HTTP version</p> <p><b>Request method:</b></p> <p>The method defines the CONNECT method which is used during the web browser and server communication. It is always written in Upper Case letters. The primary method in HTTP is <b>GET</b>. The GET method is used when -</p> <ol style="list-style-type: none"> <li>1. You type a URL in address bar.</li> <li>2. When you click on some hyperlink which is present in the document.</li> </ol> <p><b>When browser downloads images for display within a HTML document. There is another commonly used method and i.e POST. The POST method is typically used to send information collected from a user form. Various methods used by HTTP are as given below</b></p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="2">HTTP Methods</th> </tr> <tr> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>GET</td> <td>The GET method is used to retrieve information from the given server using a given URI. Requests using GET should only retrieve data and should have no other effect on the data.</td> </tr> <tr> <td>HEAD</td> <td>Same as GET, but it transfers the status line and the header section only.</td> </tr> <tr> <td>POST</td> <td>A POST request is used to send data to the server, for example, customer information, file upload, etc. using HTML forms.</td> </tr> <tr> <td>PUT</td> <td>Replaces all the current representations of the target resource with the uploaded content.</td> </tr> <tr> <td>DELETE</td> <td>Removes all the current representations of the target resource given by URI.</td> </tr> <tr> <td>CONNECT</td> <td>Establishes a tunnel to the server identified by a given URI.</td> </tr> <tr> <td>OPTIONS</td> <td>Describe the communication options for the target resource.</td> </tr> <tr> <td>TRACE</td> <td>Performs a message loop back test along with the path to the target resource.</td> </tr> </tbody> </table>	HTTP Methods		Name	Description	GET	The GET method is used to retrieve information from the given server using a given URI. Requests using GET should only retrieve data and should have no other effect on the data.	HEAD	Same as GET, but it transfers the status line and the header section only.	POST	A POST request is used to send data to the server, for example, customer information, file upload, etc. using HTML forms.	PUT	Replaces all the current representations of the target resource with the uploaded content.	DELETE	Removes all the current representations of the target resource given by URI.	CONNECT	Establishes a tunnel to the server identified by a given URI.	OPTIONS	Describe the communication options for the target resource.	TRACE	Performs a message loop back test along with the path to the target resource.
HTTP Methods																					
Name	Description																				
GET	The GET method is used to retrieve information from the given server using a given URI. Requests using GET should only retrieve data and should have no other effect on the data.																				
HEAD	Same as GET, but it transfers the status line and the header section only.																				
POST	A POST request is used to send data to the server, for example, customer information, file upload, etc. using HTML forms.																				
PUT	Replaces all the current representations of the target resource with the uploaded content.																				
DELETE	Removes all the current representations of the target resource given by URI.																				
CONNECT	Establishes a tunnel to the server identified by a given URI.																				
OPTIONS	Describe the communication options for the target resource.																				
TRACE	Performs a message loop back test along with the path to the target resource.																				

## Request URI

The Uniform Resource Identifier (URI) is a string used to identify the names or resources on the Internet. The URI is a combination of URL and URN. The URL stands for Uniform Resource Locator and URN stands for Uniform Resource Name. The web address denotes the URL and specific name of the place or a person or item denotes the URN. For example Urn :ISBN 978-81-8431-123-2 specifies the address of some book.

Every URI consists of two parts, the part before the colon: denotes the scheme and the part after colon depend upon the **scheme**. The URIs are case insensitive but generally written in lower case. If the URI is written in the form of http: then it is both an URI and URL but there are some other URI which can also be used as URL. For example

URL	Intended Server
ftp://ftp.mywebsite.com/index.txt	File can be located on FTP server
telnet://mywebsite.org	Telnet Server
mailto:myself@ mywebsite.org	Mail Box
http://www.mywebsite.org	Web Server

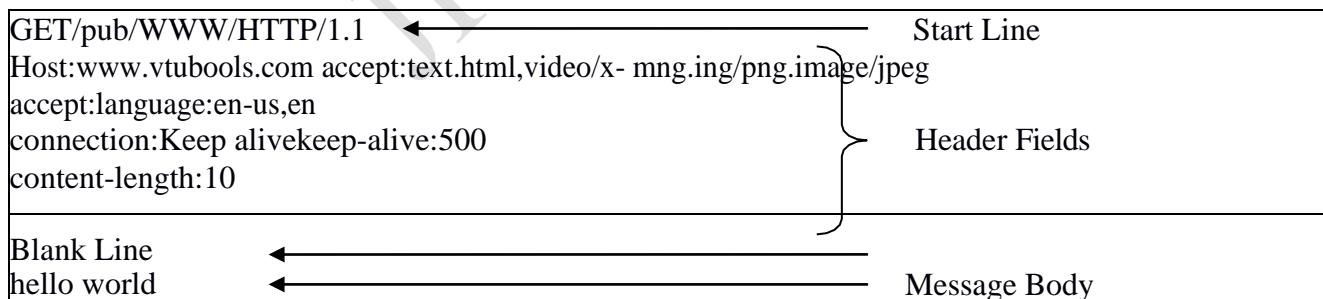
## HTTP Version:

The first HTTP version was HTTP/0.9 but the official version of HTTP was HTTP/1.1.

## Header Fields and Message body

The host header field is associated with the HTTP request. The header fields are in the form of field name and field value. Thus typical structure of http request is given in the diagram

## HTTP Request Message Structure:



## HTTP Response Message Structure:

The structure of response message is similar to the request message structure. It is as follows

<**status line**>

<**Header fields**>

<**Blank Line**>

<**Message Body**>

Following table explains some commonly used status codes:

The header field in the response message is similar to that of the request message. The message body consists of response message.

**For example**

```

HTTP/1.1 200 OK
Date: Fri, 1 Jan 2010 07:59:01 GMT
Server:Apache/2.0.50 (Unix) mod_perl/1.99_10 perl/v5.8.4 Mod_ssl/2.0.50
OpenSSL/0.9.7d DAV/2 PHP/4.3.8
Last-Modified: Mon, 23 Feb 2009 08:32:41 GMT Accept-Ranges: bytes
Content-Length:2010 Content-Type: text/html
<!DOCTYPE HTML PUBLIC --//W3C//DTD HTML 4.01
Transitional//EN>
<html>...</html>
```

The response header fields are enlisted in the following table:

<b>Header field</b>	<b>Description</b>
<b>Date</b> is generated	It represents the date and time at which the response
<b>Server</b>	The name of the server which is responding.
<b>Last-Modified</b> modified.	The date and time at which the response is last
It specifies the unit which is used by the client to accept the range request. For example <b>Accept-ranges</b>	if there is a large document and only a single web page is currently needed then this specifies the Accept-range
<b>Cache Control:</b>	

**HTTP Tunnelling:****Features of HTTP Protocol:**

3.

**Explain in details about web Authoring Tools BTL2****Definition:**

A web authoring tool is a software package which developers use to create and package e- learning content deliverable to end users. The multimedia authoring tools provide the capability for creating a complete multimedia presentation, including interactive user control.

Some examples of the authoring tools are:

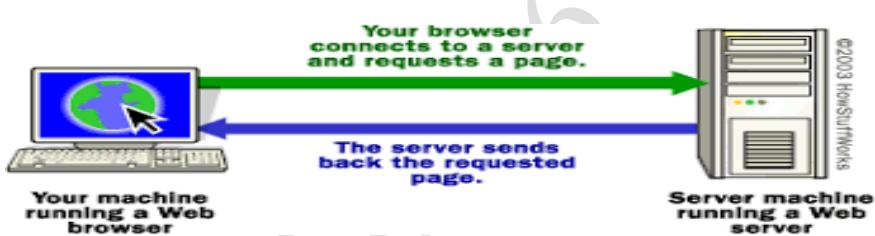
1. Macromedia Flash
2. Macromedia Director
3. Author ware
4. Quest

Authoring software provides an integrated environment for combining the content and functions of a project. It enables the developer to create, edit, and import data. In multimedia authoring tools, multimedia elements and events are considered as object. Each object is assigned properties and modifiers. On receiving messages, the objects perform tasks depending upon properties and

	<p>modifiers.</p> <p><b>Features of Authoring tools:</b></p> <ol style="list-style-type: none"> <li><b>1. Programming Features</b></li> <li><b>2. Interactivity features</b></li> <li><b>3. Editing and organizing features</b></li> <li><b>4. Delivery Features</b></li> <li><b>5. Cross Platform feature</b></li> </ol> <p><b>Examples of Authoring Tools</b></p> <ol style="list-style-type: none"> <li><b>1. Macromedia Flash</b></li> <li><b>2. HyperCard</b></li> <li><b>3. Front Page</b></li> <li><b>4. Dreamweaver</b></li> <li><b>5. Netobjects Fusion</b></li> </ol>
4.	<p><b>Explain in details about the Types Of Server BTL2</b></p> <p><b>Application Server - Web Server - Database Server</b></p> <p><b>Web Server:</b></p> <p>Web servers are computers that deliver (serves up) Web pages. Every Web server has an IP address and possibly a domain name. For example, if you enter the URL <a href="http://www.webopedia.com/index.html">http://www.webopedia.com/index.html</a> in your browser, this sends a request to the Web server whose domain name is webopedia.com. The server then fetches the page named index.html and sends it to your browser.</p> <p>Any computer can be turned into a Web server by installing server software and connecting the machine to the Internet. There are many Web server software applications, including public domain software and commercial packages.</p> <p><b>Functions of web server:</b></p> <ul style="list-style-type: none"> <li>• The web server accepts the requests from the web browser.</li> <li>• The user request is processed by the web server</li> <li>• The web server responds to the users by providing the services which they demand for over the web browsers.</li> <li>• The web servers serve the web based applications</li> <li>• The DNS translate the domain names into the IP addresses</li> <li>• The server verifies for the given address, finds the necessary files, runs appropriate scripts, exchange cookies if necessary and returns back to the browser</li> <li>• Some servers actively participate in session handling techniques.</li> </ul>

## Examples of web servers: Apache web server, IIS web server

Apache web server	IIS web server
Apache web server is useful on both Unix based systems and on Windows platform	IIS web server is used on Windows Platform
It is an open source product that provides reliability and efficiency	It is vendor specific product and can be used on windows product only
The Apache web server can be controlled by editing the configuration file httpd.conf	For IIS web server, the behaviour is controlled by modifying the window based management programs called IIS snap-in. We can access IIS snap-in through the Control -Panel ->Administrative Tools
It is also called a free web server named as LAMP : (Linux/Apache/MySQL/PHP)	It is currently owned by Microsoft, and was designed with .NET frameworks.



## Database Server:

Database is a collection of information that is organized so that it can be easily accessed, managed and updated. Data is organised into rows, columns and tables and it is indexed to make it easier to find relevant information. Data gets updated, expanded and deleted as new information is added.

Database Management is a piece of software that manages databases and lets you create, edit and delete databases.

**DBMS examples** include MySQL, PostgreSQL, Microsoft Access, SQL Server, FileMaker, Oracle, RDBMS, dBase, Clipper, and FoxPro.

## What is a database server?

It is similar to data warehouse where the website store or maintain their data and information. A Database Server is a computer in a LAN that is dedicated to database storage and retrieval. The database server holds the Database Management System (DBMS) and the databases. Upon requests from the client machines, it searches the database for selected records and passes them back over the network.



### **Application Server:**

An application server is a server program in a computer in a distributed network that provides the business logic for an application program. The application server is frequently viewed as part of a three-tier application, consisting of a graphical user interface (GUI) server, an application (business logic) server, and a database and transaction server. More descriptively, it can be viewed as dividing an application into:

- A first-tier, front-end, Web browser-based graphical user interface, usually at a personal computer or workstation
- A middle-tier business logic application or set of applications, possibly on a local area network or intranet server
- A third-tier, back-end, database and transaction server, sometimes on a mainframe or large server

The examples of application servers:

**Jboss** : open-source server from Jboss community

**Glassfish**: provided by Sun Microsystem, now acquired by Oracle

**Weblogic** : provided by Oracle

**Websphere** : provided by IBM

## UNIT II - SCRIPTING ESSENTIALS

**Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts**

### PART – A

Q. NO	QUESTIONS
1	<p><b>What is PHP? BTL1</b></p> <p>PHP is a server side scripting language that is embedded in HTML. It is used to manage dynamic content, databases, session tracking, even build entire e-commerce sites. PHP supports a large number of major protocols such as POP3, IMAP, and LDAP</p>
2	<p><b>State the characteristics of PHP.BTL2</b></p> <p>Five important characteristics make PHP's practical nature possible –</p> <ul style="list-style-type: none"> <li>• Simplicity</li> <li>• Efficiency</li> <li>• Security</li> <li>• Flexibility</li> <li>• Familiarity</li> </ul>
3	<p><b>What is client side scripting?BTL1</b></p> <p>The processing takes place on the end users computer. The source code is transferred from the web server to the user's computer over the internet and run directly in the browser. The scripting language needs to be enabled on the client computer.</p>
4	<p><b>Define server side scripting. BTL2</b></p> <p>The server-side environment that runs a scripting language is a web server. A user's request is fulfilled by running a script directly on the web server to generate dynamic HTML pages. This HTML is then sent to the client browser. It is usually used to provide interactive web sites that interface to databases or other data stores on the server.</p>
5	<p><b>What is scripting languages?BTL1</b></p> <p>A high-level programming language that is interpreted by another program at runtime rather than compiled by the computer's processor as other programming languages (such as C and C++) are. Scripting languages, which can be embedded within HTML, commonly are used to add functionality to a Web page, such as different menu styles or graphic displays or to serve dynamic advertisements.</p>

6	<p><b>State the types of scripting languages.BTL2</b></p> <ul style="list-style-type: none"> <li>• JavaScript</li> <li>• ASP</li> <li>• JSP</li> </ul> <p><b>1. PHP</b></p> <ul style="list-style-type: none"> <li>• Perl</li> <li>• Python</li> </ul> <p><b>2.</b></p>
7	<p><b>List the data types available in PHP.BTL3</b></p> <ul style="list-style-type: none"> <li>• Integers – are whole numbers, without a decimal point, like 4195.</li> <li>• Doubles – are floating-point numbers, like 3.14159 or 49.1.</li> <li>• Booleans – have only two possible values either true or false.</li> <li>• NULL – is a special type that only has one value: NULL.</li> <li>• Strings – are sequences of characters, like 'PHP supports string operations.'</li> <li>• Arrays – are named and indexed collections of other values.</li> <li>• Objects – are instances of programmer-defined classes, which can package up both other kinds of values and functions that are specific to the class.</li> <li>• Resources – are special variables that hold references to resources external to PHP (such as database connections).</li> </ul>
8	<p><b>What are the rules for naming variables?BTL2</b></p> <p>Rules for naming a variable is –</p> <ul style="list-style-type: none"> <li>• Variable names must begin with a letter or underscore character.</li> <li>• A variable name can consist of numbers, letters, underscores but you cannot use characters like + , - , % , ( , ) . &amp; ,etc</li> </ul>
9	<p><b>List the operators in PHP.BTL2</b></p> <ul style="list-style-type: none"> <li>• Arithmetic Operators</li> <li>• Comparison Operators</li> <li>• Logical (or Relational) Operators</li> <li>• Assignment Operators</li> <li>• Conditional (or ternary) Operators</li> </ul>
10	<p><b>What is function?BTL1</b></p> <p>Functions are used to separate out sections of code that perform a particular task.</p> <p><i>Example 3-12. A simple function declaration</i></p> <pre>&lt;?php function longdate(\$timestamp) { return date("l F jS Y", \$timestamp); } ?&gt;</pre>
11	<p><b>What is switch statement?BTL1</b></p> <p>If you want to select one of many blocks of code to be executed, use the Switch statement.</p> <p>The switch statement is used to avoid long blocks of if..elseif..else code.</p> <pre>(exp ressi on){</pre>

	<pre> case    labe l1: code to be executed if expression = label1; break; case label2: code to be executed if expression = label2; break; default: code to be executed if expression is different from both label1 and label2; } </pre>
12	<p><b>State the array types.BTL2</b></p> <p>There are three different kind of arrays and each array value is accessed using an ID c which is called array index.</p> <ul style="list-style-type: none"> <li>• Numeric array – An array with a numeric index. Values are stored and accessed in linear fashion.</li> <li>• Associative array – An array with strings as index. This stores element values in association with key values rather than in a strict linear index order.</li> <li>• Multidimensional array – An array containing one or more arrays and values are accessed using multiple indices</li> </ul>
13	<p><b>How to concatenate 2 strings using PHP?BTL3</b></p> <p>To concatenate two string variables together, use the dot (.) operator –</p> <pre> &lt;?php \$string1="Hello World"; \$string2="1234";  echo \$string1 . " " . \$string2; ?&gt; </pre>
14	<p><b>State the use of strpos() function in PHP.BTL2</b></p> <p>The strpos() function is used to search for a string or character within a string. If a match is found in the string, this function will return the position of the first match. If no match is found, it will return FALSE. Eg:</p> <pre> &lt;?php echo strpos("Hello world!","world"); ?&gt; </pre>
15	<p><b>What is a cookie?BTL1</b></p> <p>Cookies are text files stored on the client computer and they are kept of use tracking purpose. PHP transparently supports HTTP cookies. There are three steps involved in identifying returning users –</p> <ul style="list-style-type: none"> <li>• Server script sends a set of cookies to the browser. For example name, age, or identification number etc.</li> </ul>

	<ul style="list-style-type: none"> <li>• Browser stores this information on local machine for future use.</li> </ul> <p><b>2. When next time browser sends any request to web server then it sends those cookies information to the server and server uses that information to identify the user</b></p>
16	<p><b>What is the difference between \$variable = 1 and \$variable ==1? BTL2</b></p> <p>\$variable = 1 is an assignment statement, whereas \$variable == 1 is a comparison operator. Use \$variable = 1 to set the value of \$variable. Use \$variable == 1 to find out later in the program whether \$variable equals 1. If you mistakenly use \$variable = 1 where you meant to do a comparison, it will do two things you probably don't want: set \$variable to 1 and return a true value all the time, no matter what its previous value was.</p>
17	<p><b>What is the purpose of functions?BTL2</b></p> <p>The purpose of functions is to separate discrete sections of code into their own, self contained sections that can be referenced by a single function name.</p>
18	<p><b>Which PHP function converts HTML into a format that can be displayed but will not be interpreted as HTML by a browser?BTL3</b></p> <p>To convert HTML into a format that can be displayed but will not be interpreted as HTML by a browser, use the PHP html entities function.</p>
19	<p><b>How do if and while statements interpret conditional expressions of different data types? BTL3</b></p> <p>Most conditional expressions in if and while statements are literal (or Boolean) and therefore trigger execution when they evaluate to TRUE. Numeric expressions trigger execution when they evaluate to a nonzero value. String expressions trigger execution when they evaluate to a nonempty string. A NULL value is evaluated as false and therefore does not trigger execution.</p> <p>3.</p>
20	<p><b>What are the ways to send information to the web server?BTL3</b></p> <p>There are two ways the browser client can send information to the web server. Before the browser sends the information, it encodes it using a scheme called URL encoding.</p> <p>The GET Method The POST Method</p>
	<b>Part *B</b>
1.	<p><b>Write down the Need For Scripting Languages BTL2</b></p> <p><b>Definition of Scripting Language:</b> A scripting language is a programming language designed for integrating and communicating with other programming languages. Some of the most widely used scripting languages are HTML, JavaScript, VBScript, PHP, Perl, Python, Ruby, and ASP and so on.</p> <p>1. In general, scripting languages are easier to learn and faster to code in more structured and compiled languages such as C and C++.</p>

2. Scripting languages are useful tools for developing interactive web pages with minimum efforts.
3. Scripting Languages are often interpreted (rather than compiled).
4. The scripting languages are useful for producing dynamic web contents. That means web page can be changed using user input.

### **Advantages of Scripting Languages:**

5. Scripting languages are easy to learn.
6. It requires minimum programming knowledge or experience to develop the web pages using scripting languages.
7. The scripting languages allow simple creation and editing in variety of text editors.
8. Using scripting languages we can develop dynamic and interactive web pages.
9. There are some scripting languages that validate the information entered by the user.

### **TYPES OF SCRIPTING LANGUAGES**

#### **Client Side Scripting Language:**

The client side scripting is used to create the web pages as a request or response to server. These pages are displayed to the user on web browser. For example: HTML, CSS, JavaScript, PHP.

#### **Server Side Scripting Language:**

Server side scripting is used to create web pages that provide some services. These scripts generally run on web servers. For example: ASP, JSP, Servlet, PHP.

### **Difference between Client side and Server side scripting languages**

<b>Server Side Scripting</b>	<b>Client Side Scripting</b>
The server side scripting is used to create the web pages that provide some services.	The client side scripting is used to create the web pages as a request or response to server. These pages are displayed to the user on web browser.
A user's request is fulfilled by running a script directly on the web server to generate dynamic HTML pages. This HTML is then sent to the client browser.	The processing of these scripts takes place on the end user's computer. The source code is transferred from the user's computer over the internet and run directly in the browser.
<b>Uses:</b> processing of user request, accessing to databases.	<b>Uses:</b> making interactive web pages, for interacting with temporary storages such as cookies or local storage, sending request to server and getting the response and displaying that response in web browser.
These scripts generally run on web servers.	These scripts generally run on web browser.
<b>Example:</b> PHP, ASP.NET, C++, java and C#.	<b>Example:</b> HTML, CSS, JavaScript.

2. **Explain in details about working principles and basic operation of PHP. BTL2**
- PHP was developed in 1994 by Apache group. PHP stands for PHP: Hypertext Pre- processor. PHP is a server-side scripting language. It is mainly used for form handling and database access. It is free to download and use.
- PHP is a server side scripting language embedded in XHTML. It is an alternative to CGI, ASP, ASP.NET and JSP. The extension to PHP files are .php, .php3 or .phtml. The PHP processor works in two modes. If the PHP processor finds XHTML tags in the PHP script then the code is simply copied to the output file. But when the PHP processor finds the PHP code in the script then

that code is simply interpreted and the output is copied to the output file.

### **Installation of PHP**

For installing PHP either PHP installer is preferred or all in package like XAMPP/WAMPP is preferred. Before installing PHP, install Apache web server on your PC. The PHP installer can be downloadable from [www.php.net/download](http://www.php.net/download).

**Exercise:** Explain how can you create a web based application using XAMPP. Give all the steps required in detail.

#### **Solution:**

XAMPP is a free distribution package that makes it easy to install Apache web server, Mysql, PHP, PERL. Here in XAMPP(The X stands for any OS) or WAMPP(the W stands for Windows OS).

**Step 1:** Go to the site : <https://www.apachefriends.org/index.html>

**Step 2:** Click on download XAMPP for windows or Linux depending upon your operating system.

**Step 3:** When prompted for the download, click -Save|| and wait for your download to finish.

**Step 4:** Install the program, and click on -RUN||. Accept default settings by clicking next button. Finally you will get installation completion message.

**Step 5:** On your drive, the XAMPP folder will be created. Click onxampp\_start file, this will enable to start Apache, Mysql and Tomact.

**Step 6:** Write a PHP script and save it in C:\XAMPP\htdocs\php-examples folder by giving the filename and extension as .php.

**Step 7:** Open the web browser and type <http://localhost/php-examples/yourfilename.php>

**Step 8:** The web application will be executed within your web browser.

For example:

```
<? php
$ss="I like
PHP"; echo
$ss;
?>
```

### **GENERAL SYNTACTIC CHARACTERISTICS OF PHP**

1. PHP code can be embedded in the XHMTL document. The code must be enclosed within <? php and ?>
2. If the PHP script is stored in some another file and if it needs to be referred then include construct is used. The variable names in PHP begin, with the \$ sign.  
Following are some reserved keywords that are used in PHP.

And	Default	False	If	Or	This
Break	Do	For	Include	Require	True
Case	Else	Foreach	List	Return	Var
Class	Elseif	Function	New	Static	Virtual
Continue	Extends	Global	Not	Switch	While
					Xor

**The comments in PHP can be #, //, /, /\*. \*/. The PHP statements are terminated by semicolon**  
**How to write and execute PHP document?**

Open some suitable text editor like Notepad and type the following code. Save the code by the extension **.php**. It is expected that the PHP code must be stored in **htdocs** folder of Apache. As I have installed **xampp**, I have got the directory c:\xampp\htdocs. I have created a folder named **php-examples** inside the **htdocs** and stored all my PHP documents in that folder. Hence, when i want to get the output of the PHP code I always give the URL.

### **PHP Variable**

1. Variables are the entities that are used for storing the values. PHP is a dynamically typed language. That is PHP has no type declaration. The value can be assigned to the variable in the following manner:

**\$variable\_name=value;**

2. If the value is not assigned to the variable then by default the value is NULL. The unsigned variables are called unbound variables. If unbound variable is used in the expression then its NULL value is converted to the value 0.

Following are some rules that must be followed while using the variables:

3. The variable must start with letter or underscore but it should not begin with a number.
4. It consists of alphanumeric characters or underscore.
5. There should not be space in the name of the variable
6. While assigning the values to the variables the variable must start with the \$. For example,  
\$marks=100;
7. Using the function IsSet the value of the variable can be tested. That means if isSet(\$marks) function returns TRUE then that means some value is assigned to the variable marks.
8. If the unbound variable gets referenced then the error reporting can be done with the help of function error\_reporting(7). The default error reporting level is 7.

### **Variable**

#### **Scope Local**

#### **variables**

Local variables are variables that are created within, and can only be accessed by, a function. They are generally temporary variables that are used to store partially processed results prior to the function's return.

One set of local variables is the list of arguments to a function.

#### **Global variables**

There are cases when you need a variable to have global scope, because you want all your code to be able to access it. To declare a variable as having global scope, use the keyword **global**.

Syntax:

Global var\_name; //This will access the global values of the variable.

#### **Static variables**

	<p>Static variables can be initialized only once. The static variable will be initialized for the first time. Static variable will not be initialized whenever it is declared.</p> <p><b>Data Types</b></p> <p>There are four scalar types that are used in PHP and those are Integer, Boolean, Double and String.</p> <p><b>Integer Type</b></p> <ol style="list-style-type: none"> <li>1. For displaying the integer value the Integer type is used.</li> <li>2. It is similar to the long data type in C.</li> <li>3. The size is 32 bit.</li> </ol> <p><b>Double Type</b></p> <ol style="list-style-type: none"> <li>4. For displaying the real values the double data is used</li> <li>5. It includes the numbers with decimal point, exponentiation or both. The exponent can be represented by E or e followed by integer literal.</li> <li>6. It is not compulsory to have digits before and after the decimal point. For instance .123 or 123. is allowed in PHP.</li> </ol> <p><b>String Type</b></p> <ol style="list-style-type: none"> <li>7. There is no character data type in PHP. If the character has to be represented then it is represented using the string type itself; but in this case the string is considered to be of length 1.</li> <li>8. The string literal can be defined using either single or double quotes.</li> <li>9. In single quotes the escape sequence or the values of the literals can not be recognized by PHP but in double quotes the escape sequence can be recognized. For example : -The total marks are=\$marks will be typed as it is but -The total marks are=\$marks will display the value of \$mark variable.</li> </ol> <p><b>Boolean Type</b></p> <ol style="list-style-type: none"> <li>10. There are only two types of values that can be defined by the Boolean type and those are TRUE and FALSE.</li> <li>11. If Boolean values are used in context of integer type variable then TRUE will be interpreted as 1 and FALSE will be interpreted as 0.</li> <li>12. If Boolean values are used in context of double type then the FALSE will be interpreted as 0.0.</li> </ol> <p><b>Constants</b></p> <ol style="list-style-type: none"> <li>13. Constant is an identifier that contains some value. Once the constant value is assigned to this identifier it does not get changed. Constant is case sensitive by default.</li> <li>14. Generally the constant identifier is specified in upper case. The valid constant name must start with letters or underscore. It may then be followed by digits.</li> <li>15. Using define function we can assign value to the constant. The first parameter is define function is the name of the constant and the second parameter is the value which is to be assigned.</li> </ol>
3	<p><b>Write down the various Operators used in PHP BTL2</b></p> <p><b>Arithmetic Operators and Operations</b></p> <ul style="list-style-type: none"> <li>• PHP supports the collection of arithmetic operators such as +, -, *, /, %, ++ and – with their usual meaning.</li> <li>• While using the arithmetic operators if both the operands if both the operands are integer then the result will be integer itself.</li> <li>• If either of the two operands is double then the result will be double.</li> </ul>

Operator	Description	Example	Result
+	Addition	<code>\$a = 2 + 5;</code>	<code>\$a=7</code>
-	Subtraction	<code>\$a = 10 - 2;</code>	<code>\$a=8</code>
*	Multiplication	<code>\$a = 2 * 5;</code>	<code>\$a=10</code>
/	Division	<code>\$a = 15 / 5;</code>	<code>\$a=3</code>
%	Modulus	<code>\$a = 23 % 7;</code>	<code>\$a=3.28</code>
++	Increment	<code>\$a = 5; \$a ++;</code>	<code>\$a=6</code>
--	Decrement	<code>\$a = 5; \$a --;</code>	<code>\$a=4</code>

- PHP has large number of predefined functions. Some of these functions are enlisted in the following table:

Function	Purpose
Floor	The largest integer less than or equal to the parameter is returned.
Ceil	The smallest integer less than or equal to the parameter is returned.
Round	Nearest integer is returned
Abs	Returns the absolute value of the parameter
Min	It returns the smallest element.
Max	It returns the largest element.

### Increment and Decrement Operators:

It is also called as the unary operator. It usually increments or decrements the value by one.

Operator	Name	Description
<code>++\$a</code>	Pre-increment	Increments \$a by one, then returns \$a
<code>\$a++</code>	Post-increment	Returns \$a, then increments \$a by one
<code>--\$a</code>	Pre-decrement	Decrements \$a by one, then returns \$a
<code>\$a--</code>	Post-decrement	Returns \$a, then decrements \$a by one

### Assignment Operators in PHP

Assignment operator is used to assign a value to a variable

Operator	Example	Is the same as
<code>=</code>	<code>x=y</code>	<code>x=y</code>
<code>+=</code>	<code>x+=y</code>	<code>x=x+y</code>
<code>-=</code>	<code>x-=y</code>	<code>x=x-y</code>
<code>*=</code>	<code>x*=y</code>	<code>x=x*y</code>
<code>/=</code>	<code>x/=y</code>	<code>x=x/y</code>
<code>.=</code>	<code>x.=y</code>	<code>x=x.y</code>
<code>%=</code>	<code>x%-=y</code>	<code>x=x%y</code>

Logical operators produce true-or-false results, and therefore are also known as Boolean operators. There are four of them.

Operator	Description	Example
&&	And	\$j == 3 && \$k == 2
and	Low-precedence and	\$j == 3 and \$k == 2
	Or	\$j < 5    \$j > 10
or	Low-precedence or	\$j < 5 or \$j > 10
!	Not	! (\$j == \$k)
xor	Exclusive or	\$j xor \$k

## Relational Operators or Comparison Operator

Relational operators test two operands and return a Boolean result of either TRUE or FALSE. There are three types of relational operators: equality, comparison, and logical. It is also called as comparison operator.

Operator	Description
==	Equality
====	Identity(Checks both value and type)
!=	Not Equal
<	Less than
<=	Less than or equal
>	Greater than
>=	Greater than or equal

## String Operators in PHP

Operator	Name	Example	Result
.	Concatenation	\$a = "Hello" \$b = \$a . " world!"	\$b = "Hello world!"
.=	Concatenation Assignment	\$a = "Hello" \$a .= " world!"	\$a = "Hello world!"

## Boolean Operators

Boolean operators AND, OR, and NOT are used to manipulate logical statements. Boolean operators are the core operators used in digital control systems as well as computer systems. AND and OR are binary operators, while NOT is a unary operator.

Operator	Meaning
And &&	The binary AND operation is performed
Or	The binary OR operation is performed
Xor	The XOR operation will be performed

4.	<p><b>Explain in details about various operation in Flow Control And Loop using PHP BTL2</b></p> <p><b>The if Statement in PHP</b></p> <ul style="list-style-type: none"> <li>The <b>if statement</b>, the <b>if...else</b> statement or <b>if... elseif</b> statements are used as selection statements. The selection is based on some condition.</li> <li>If statement executes some code only if a specified condition is true</li> </ul> <p><b>Syntax:</b></p> <pre>if (condition) {     code to be executed if condition is true; }</pre> <p><b>The if...else Statement in PHP</b></p> <p>If...else statement executes some code if a condition is true and some another code if the condition is false</p> <p><b>Syntax:</b></p> <pre>if (condition) {     code to be executed if condition is true; } else {     code to be executed if condition is false; }</pre> <p><b>The if...elseif...else Statement in PHP</b></p> <p>If...elseif...else statement selects one of several blocks of code to be executed</p> <p><b>Syntax:</b></p> <pre>if (condition) {     code to be executed if condition is true; } elseif (condition) {     code to be executed if condition is true; } else {     code to be executed if condition is false; }</pre> <p><b>Switch Statements</b></p> <p>Similar to if statement the switch statement can also be used for selection. Following is a simple PHP script for demonstrating switch statements</p> <p><b>Syntax:</b></p>
----	--

```

switch (n)
{
    case
    label1:
        code to be executed if
        n=label1; break;
    case label2:
        code to be executed if
        n=label2; break;
    ...
    default:
        code to be executed if n is different from all labels;
}

```

### **Loop Statements**

- The while, for and do-while statements of PHP are similar to Javascript.
- Following is a simple PHP script which displays the first 10 number.

### **For loop in PHP**

PHP for loop executes a block of code, a specified number of times

#### **Syntax:**

```

for (initialization; test condition; increment/decrement)
{
    code to be executed;
}

```

### **While Loop in PHP**

While loop, loops through a block of code as long as the specified condition is true

#### **Syntax:**

```

while (condition)
{
    code to be executed;
}

```

### **Do While loop in PHP**

Do while loop will always execute the block of code once, it will then check the condition, and if the condition is true then it repeats the loop

#### **Syntax:**

```

do {
    code to be executed;
} while (condition );

```

### **Break statement**

	<p>Break statement is used to terminate the loop. After the break statement is executed the control goes to the statement immediately after the loop containing break statement</p> <p><b>Continue statement</b></p> <p>There are cases in which, rather than terminating a loop, you simply want to skip over the remainder of iteration and immediately skip over to the next. Continue statement is used to skip a particular iteration of the loop.</p>
5	<p><b>Write PHP programs to print whether current year is leap year or not. Sol BTL3</b></p> <pre>&lt;html&gt; &lt;head&gt; &lt;title&gt; Leap year demo&lt;/title&gt; &lt;/head&gt; &lt;body&gt; &lt;?php \$year=2016; print -&lt;br/&gt;; if(\$year%4== 1) { printf(-Year %d is not a leap year,\$year); } else { printf(-Year %d is a leap year,\$year); } ?&gt; &lt;/body&gt; &lt;/html&gt;</pre>
6	<p><b>Write a PHP Script to compute the sum and average of N numbers. BTL3</b></p> <p><b>PHP Program</b></p> <pre>&lt;html&gt; &lt;head&gt; &lt;title&gt; Sum and Average &lt;/title&gt; &lt;/head&gt; &lt;body&gt; &lt;center&gt; &lt;?php \$sum=0; for(\$i=1;\$i&lt;=10;\$i+ +) { \$sum += \$i; } \$avg=\$sum/10; print -The sum is : \$sum; print -&lt;br/&gt;;</pre>

	<pre> print -The average is : \$avg"; ?&gt; &lt;/center&gt; &lt;/body&gt; &lt;/html&gt; </pre>
7.	<p><b>How to create Arrays using PHP and explain various operation it briefly.BTL3</b></p> <ul style="list-style-type: none"> <li>• Arrays is a collection of similar type of elements but in PHP you can have the elements of mixed type together in single array.</li> <li>• In each PHP, each element has two parts <b>Key</b> and <b>Value</b>.</li> <li>• The key represents the index at which the value of the element can be stored.</li> <li>• The <b>keys</b> are positive integers that are in ascending order.</li> </ul> <p><b>Array Creation</b></p> <p>In PHP there are two types of arrays -</p> <ol style="list-style-type: none"> <li>1. <b>Indexed Array:</b> Indexed array are the arrays with numeric index. The array values can be stored from index 0. For example -</li> </ol> <pre> &lt;html&gt; &lt;head&gt; &lt;title&gt; PHP Indexed arrays&lt;/title&gt; &lt;/head&gt; &lt;body&gt; &lt;?php \$names=array("AAA","BBB","CCC"); print_r(\$names);//print array structure ?&gt; &lt;/body&gt; &lt;/html&gt; </pre> <p>Here values gets stored at corresponding index as follows -</p> <pre> \$mylist[0]=10; \$mylist[1]=20; \$mylist[2]=30; \$mylist[3]=40; \$mylist[4]=50; </pre> <p>We can directly assign some value at specific index.</p> <pre> \$mylist[5]=100; </pre> <ol style="list-style-type: none"> <li>2. <b>Associated Array :</b> Associated arrays are the arrays with named keys. It is a kind of array with <b>name</b> and <b>value</b> pair. For example -</li> </ol> <pre> &lt;html&gt; &lt;head&gt; &lt;title&gt; PHP Associated Array&lt;/title&gt; &lt;/head&gt; &lt;body&gt; &lt;?php \$city[-AAA]=-Pune; </pre>

```
$city[-BBB]=Mumbai;
$city[-CCC]=Chennai;
```

### **1. //printing array structures print\_r(\$city);**

#### **Multidimensional array in PHP**

Multidimensional array is an array containing one or more arrays

#### **Multidimensional array Example**

```
<html>
<body>
<?php
/* Here $flower_shop is an array, where rose, daisy and orchid are the ID key which indicates
rows and points to array which have column values. */

$flower_shop = array(
    "rose" => array( "5.00", "7 items", "red" ), "daisy" => array( "4.00", "3 items", "blue" ), "orchid" =>
array( "2.00", "1 item", "white" ), );
/* in the array $flower_shop['rose'][0], 'rose' indicates row and '_0' indicates column
*/ echo "rose costs ".$flower_shop['rose'][0]."items: ".$flower_shop['rose'][1]."<br>";
echo "rose costs ".$flower_shop['daisy'][0]."items: ".$flower_shop['daisy'][1]."<br>";
echo "rose costs ".$flower_shop['orchid'][0]."items: ".$flower_shop['orchid'][1]."<br>";
?>
</body>
</html>
```

#### **Functions Dealing with**

##### **Arrays 1.is\_array**

check whether a variable is an array

```
if(is_array($array)
{
    Return true;
}
Else
    Return false;
```

##### **2. Count**

count all the elements in the top level of an array. echo count(\$fred);

##### **3. sort**

Sorting is so common that PHP provides a built-in function. sort(\$fred);

**4. shuffle**  
elements of an array to be put in random order  
shuffle(\$cards);

#### **5. explode**

Sveral items separated by a single character (or string of characters) and then place each of these items into an array.

```
<?php
$temp = explode('***',
"A***sentence***with***asterisks"); print_r($temp);
?>
```

#### **6. Reset**

It reset the array pointer to the first elemet of the array. reset(\$fred); // Throw away return value

```
$item = reset($fred); // Keep first element of the array in $item
```

#### **7. End**

It moves the pointer to the end of the array.

```
end($fred);
$item = end($fred);
```

#### **8. Unset**

The unset function is used to remove particular element from the array. For example consider following PHP document

```
?>
```

### **Sequential Access to Array Elements**

- The array element references start at the first element and every array maintains an internal pointer using which the next element can be easily accessible. This helps to access the array elements in sequential manner.
- The pointer **current** is used to point to the current element in the array. Using the **next** function the next subsequent element can be accessed. Following PHP code illustrates this idea .

#### **1. Each**

Using **each** function we can iterate through the array elements

#### **PHP Program**

```
<?php
$mylist=array(-Hello||PHP||You||Are||Wonderfull||
); while($myval=each($mylist)
{
$val=$myval[-value];
print("The current value of the array is
<b>$val</b>"); print "<br/>";
}
?>
```

**2.foreach**

The **foreach** function is used to iterate through all the elements of the loop. The syntax of foreach statement is as follows -

```
foreach($array as $value)
{
statements to be executed
}
```

The above code can be modified and written as follows -

**PHP Program**

```
<?php
$mylist=array(-Hello,PHP,You,Are,Wonderfull!);
foreach($mylist as $value)
{
print (-The current value of the array is <b> $value
</b>); print -<br/>;
}
?>
```

**Sorting Arrays**

- Sorting is the process in which the element of arrays in some specific order. There are two types of ordering which are followed in sorting – ascending order and descending order. Basically PHP uses **sort** function for sorting the array elements. There are some other functions that are also available for sorting the arrays in desired manner.
- The **sort** function sorts the array based on the values. After applying the sort function this function assigns new keys to the values of the array. Following PHP document illustrates these functions –
- The **asort()** function sorts an array by the values. But the original keys are kept.
- The **ksort()** function sorts the array by keys but each value's original key is retained.

8. Use an array to store student information such as enrolment no, name, semester and percentage. Output the data to a web page using PHP. BTL3

**Sol:**

```
<html>
<head></head>
<body>
<?php
$a=array(array(10,AAA,III,60),array(20,BBB,III,80),array(30,CCC,IV,40));
echo -<table border='1'>;
echo -<tr>;
echo
-<td>ENo</td><td>Name</td><td>Sem</td><td>Marks</td>;
echo -<tr/>;
for($i=0;$i<3;$i++)
{
echo -<tr>;
```

```

for($j=0;$j<4;$j+
+)
{
echo|<td>|; echo
$a[$i]{ $j];
echo|</td>|
;
}
echo -</tr>|;
}
echo -</table>|;
?>
</body>
</html>

```

#### **9. Write down the various Strings operation involved in PHP BT2**

##### **PHP String Manipulation**

PHP provides a rich set of functions to manipulate strings. In this topic, we will discuss some common functions used by PHP developers to remove spaces from a string, count the number of characters of a string, convert a string to contain upper case or lower case letters, split a string or join strings, get substrings from a string, compare strings, search for a substring in a string, and replace an old substring with a new substring of a string, etc.

##### **trim, ltrim, and rtrim functions**

trim, ltrim, and rtrim functions are used to remove space from a string.

-trim(String) removes leading and trailing space from the string.

-ltrim(String) removes leading spaces.

-rtrim(String) removes trailing spaces.

##### **strlen() function**

The strlen(String) function is used to count the number of characters of a string.

##### **strtolower, strtoupper, ucfirst, ucwords function**

The strtolower, strtoupper, ucfirst, and ucwords functions are used to change cases of a string:

- strtolower(String) changes a string to lowercase.
- strtoupper(String) changes a string to uppercase.
- ucfirst(String) capitalizes the first character of a string.
- ucwords(String) capitalizes the first character of each word in a string.

##### **strcmp() andstrcasecmp() functions**

The strcmp(String1,String2) compares String1 with String2. It returns less than zero if String1 is less than String2. If String1 is greater than String2 it return greater than zero. If both strings are equal, it returns 0. This function compares two strings in case-sensitive manner. If you want to compare two strings without case-sensitivity, you can use strcasecmp() instead.

	<p><b>split() and join() functions</b></p> <p>The split(Separator_char, String) function is used to split a string in to an array of strings by a separating character.</p> <p><b>substr() function</b></p> <p>The substr() method has two main forms:</p> <ul style="list-style-type: none"> <li>• substr(String, Start) returns a substring from the Start position to the end of the string.</li> <li>• substr(String,Start,Length) returns a substring from the Start position in which the length of the substring is equal to Length.</li> </ul> <p><b>strpos() and str_replace() functions</b></p> <p>The strpos(String, String_to_find) returns the position of the String_to_find in the String. The str_replace(Old_string,New_string,String) is used to replace the Old_string with the New_string.</p> <p><b>Example:</b></p> <pre>&lt;?php echo strlen("Hello world!");.&lt;br&gt;; echo str_word_count("Hello world!").&lt;br&gt;; echo strrev("Hello world!").&lt;br&gt;; echo strpos("Hello world!", "world").&lt;br&gt;; echo str_replace("world", "Dolly", "Hello world!").&lt;br&gt;; echo substr("Hello World",2).&lt;br&gt;; \$arr=split("l","Hello") Echo \$arr[0].&lt;br&gt;; echo strtoupper("Hello").&lt;br&gt;; echo strtolower("HELLO").&lt;br&gt;; echo trim(" Hello").&lt;br&gt;; ?&gt;</pre>
10.	<p><b>Write down the various operation involved in Functions using PHP. BTL2</b></p> <p>The functions in PHP are very much similar to the functions in C. Let us discuss it in details -</p> <p><b>General Characteristics of Functions</b></p> <ul style="list-style-type: none"> <li>• The syntax of the function definition is as follows -</li> </ul> <pre>function name_of_function(parameter list) { statements to be executed in function-name ....</pre>

- The function gets executed only after the call to that function. The call to the function can be from anywhere in the PHP code. For example -

### **PHP Program**

```
<?php
function myfun()
{
print -<i> This statement is in myfun()</i>;
}
print -<b> The Function Demo Program</b>;
print -<br/>;
myfun();
?>
```

- The **return** statement is used for returning some value from the function body. Following PHP script shows this idea.

### **PHP Program**

```
<?php
function Addition()
{
$a=10;
$b=20;
$c=$a+$b; return
$c;
}
print -<b> The Function Demo Program with return
statement</b>; print -<br/>;
print -10+20 =<?>.Addition();
?>
```

### **Parameters**

- The parameter that we pass to the function during the call is called the **actual parameter**. These parameters are generally the expressions.
- The parameters that we pass to the function while defining it is called the **formal parameter**. These are generally the variables. It is not necessary that the number of actual parameters should match with the number of formal parameters.
- If there are few actual parameters and more formal parameters then the value of formal parameters will be some unbounded one. If there are many actual parameters and few formal parameters then the excess of actual parameters will be ignored.
- The default parameter passing technique in PHP is **pass by value**. The parameter passing by value means the values of actual parameters will be copied in the formal parameters. But the values of formal parameters will not be copied to the actual parameters.
- Following PHP script illustrates the functions with parameters

### **PHP Program**

```
<?php
```

```

function Addition($a,$b)
{
$c=$a
+$b;
return
$c;
}
print -<b> The Function Demo Program with parameter passing and return statement</b>|;
print -<br/>|;
$x=10;
$y=20;
print -10+20 =||.Addition($x,$y);
?>

```

There are two ways to pass parameters by reference.

**1. Add & at the beginning of the name of the actual parameter.** For example -

```

<?php
function add_some_extra($string)
{
$string='This is a string';
$str1=&$str;//adding & at the beginning of the name of actual paramater.
print -Before function call:
$str<br/>; add_some_extra($str1);
print -After function call: $str<br/>|;
?>

```

**2. Add & to actual parameter in the function call.** For example -

```

<?php
function add_some_extra(&$string)
{
$string = -This string is replaced|;
}
$str=||This is a string|;
print -Before function call
:$str<br/>; add_some_extra($str);
print -After function call:$str<br/>|;
?>

```

#### • FUNCTION

Functions are group of statements that can perform a task

Defining a Function

The general syntax for a function is:

```

function function_name([parameter [, ...]])
{
// Statements
}

```

• A definition starts with the word function.

- A name follows, which must start with a letter or underscore, followed by any number of letters, numbers, or underscores.
- The parentheses are required.
- One or more parameters, separated by commas, are optional.

### **PHP Functions - Return values**

Functions can also return the values to the point where they have called. Return statement is used to return the value.

Syntax:

```
function func_name()
{
.....
return $variable;
}
echo func_name();
```

#### **Example:**

```
<?php
function add($x,$y)
{
$total=$x+$y; return $total;
}
echo "1 + 16 = " . add(1,16);
?>
```

#### **Call by Value:**

The changes made in the formal arguments will not be reflected back to the actual arguments.

#### **Example:**

##### **Swap Numbers PHP Example (Call by value)**

```
<?php
$num1=10;
$num2=20;
echo "Numbers before swapping:<br/>"; echo
"Num1=". $num1; echo "<br/>Num2=". $num2;
swap($num1,$num2); //call by
value function swap($n1,$n2)
{
$temp=$n1;
$n1=$n2;
$n2=$temp;
echo "<br/><br/>Numbers after
swapping:<br/>"; echo "Num1=". $n1;
echo "<br/>Num2=". $n2;
}
```

**Call by Reference:**

The changes made in the formal arguments will be reflected back to the actual arguments.

**Swap Numbers PHP Example (Call by Reference)**

```
<?php
$num1=10;
$num2=20;

echo "Numbers before swapping:<br/>"; echo "Num1=". $num1;
echo "<br/>Num2=". $num2;
swap($num1,$num2);
function swap(&$n1,&$n2) //Call by reference
{
$temp=$n1;
$n1=$n2;
$n2=$temp;
echo "<br/><br/>Numbers after
swapping:<br/>"; echo "Num1=". $n1;
echo "<br/>Num2=". $n2;
}
?>
```

**Recursive Function:**

A recursive function is a function that calls itself during its execution. This enables the function to repeat itself several times, outputting the result and the end of each iteration.

Example:

```
<?php
function factorial($number)
{
if ($number
== 0) return
1;
return $number * factorial($number - 1);
}
echo factorial(5);
?>
```

11.

**Explain in details about the various operation of File Handling using PHP BTL2**

PHP is known as a server side scripting language. Hence file handling functions such as create, read, write, append are some file related operations that are supported by PHP.

**Opening and closing files:**

The first step in file handling is opening of the file.

It takes two parameters- The first parameter of this function contains the name of the file to be opened and the second parameter specifies in which mode the file should be opened.

Modes	Description
r	Read only. Starts reading from the beginning of the file.

	<b>r+</b>	Read/Write. Starts reading from the beginning of the file
	<b>w</b>	Write only. Opens and clears the contents of the file; or creates a new file if it is not created.
	<b>w+</b>	Read/ Write. Opens and clears the contents of the file; or creates a new file if it is not created.
	<b>a</b>	Append. Opens and writes to the end of the file or creates a new file if it is not created.
	<b>a+</b>	Read/Append. Preserves the file content by writing to the end of the file.

**For example:**

```
$my_file='file.txt';
$file_handle=fopen($my_file,'a') or die("Cannot open file: '$my_file');
The fopen function returns TRUE if the required file is opened.
```

**Reading from file:**

The fread is the function which is used to read the file. It takes two parameters. The first parameter is the handle to the file and the second parameter is the number of bytes to be read. The filesize is the function which takes the filename as the parameter.

For example: \$mystring = fread(\$file\_handle, filesize('file.txt'));

There is another function named file\_get\_contents using which the contents of the file can be obtained.

The fgets() function is used to read a single line from the file. For example, following code displays the contents of the file line by line.

```
while(!feof($file_handle))
{
echo fgets($file_handle)."\n";
}
```

**Example Reading a file with fgets**

```
<?php
$fh = fopen("testfile.txt", 'r') or
die("File does not exist or you lack permission to open it");
$line =
fgets($fh);
fclose($fh);
echo $line;
?>
```

**Output:**

Line

**Example - Reading a file with fread**

```
<?php
$fh = fopen("testfile.txt", 'r') or
```

	<pre>die("File does not exist or you lack permission to open it"); \$text = fread(\$fh, 3); fclose(\$fh); echo \$text; ?&gt;</pre>
12.	<p><b>Write a PHP program to read a text file line by line and to display it on screen. BTL3</b></p> <p><b>Solution:</b></p> <p><b>Step-1:</b> Create a input file Myfile.txt as follows.</p> <p>Hello everybod y how are you?</p> <p><b>Step-2:</b> Create a PHP script for reading the input file line by line as follows.</p> <pre>&lt;?php \$file = fopen(-Myfile.txt  ,  r  ) while(!feof(\$file)) { echo fgets(\$file).  &lt;br/&gt;  ; } fclose(\$file); ?&gt;</pre>

### Part \*C

1.	<p><b>How to Write, copy, move, delete a file using PHP. BTL3</b></p> <p>The fwrite is the function which is used to write the contents to the file. It takes two parameters – The first parameter is the handle to the file and the second parameter is the number of bytes to be written. For example -</p> <pre>\$written_string = fread(\$file_handle, \$my_data);</pre> <p><b>Locking Files:</b></p> <p>Multiple PHP scripts can access the same file at a time. But this causes conflict problems. That means there can be the situation in which one script is reading the file and at the same time the other script is writing to that file. Sometimes there can be a situation in which two scripts are trying to write different data to the same file. These are totally undesirable in the file handling technique. The solution to this problem is to lock the file when one script is accessing it. Due to locking of the file, simultaneous access can be avoided. The PHP uses flock function for locking the files.</p> <p><b>Syntax of flock is</b> <b>flock(file, lock,</b></p>
----	---

**block)** where

file – name of the file which needs to be accessed. Lock- kind of lock being used. Possible values are:

LOCK\_SH – Shared Lock(reader). Allow other processes to access the file

LOCK\_EX – Exclusive Lock(writer). Prevent other processes from accessing the file. LOCK\_UN – Release a shared or exclusive lock

LOCK\_NB- Avoids blocking other processes while locking block is optional parameter.

**Example**

```
<?php
$file = fopen("myfile.txt", "w+");
flock($file, LOCK_EX)// exclusive lock
fwrite($file, "I am writing this line to
file"); flock($file, LOCK_UN);//release
lock
fclose($file);
?>
```

**Copying Files**

We can copy one file into another file using copy() function.

**Syntax:**

**Copy(“source file”, “destination file”);**

**Copying a file**

```
<?php // copyfile.php
copy('testfile.txt', 'testfile2.txt') or die("Could not copy
file");
echo "File successfully copied to 'testfile2.txt'";
```

?> If you check your folder again, you'll see that you now have the new file testfile2.txt in it. By the way, if you don't want your programs to exit on a failed copy attempt, you could try the alternate syntax.

**Moving a File**

To move a file, rename it with the rename function.

**Example**

```
<?php // movefile.php
rename('testfile2.txt',
'testfile2.new');
else echo "File successfully renamed to 'testfile2.new'";
?>
```

You can use the rename function on directories, too. To avoid any warning messages, if the original file doesn't exist, you can call the file\_exists function first to check.

**Deleting a File**

Deleting a file is just a matter of using the unlink function to remove it from the filesystem, as in Example 7-10.

Example 7-10. Deleting a file

```
<?php // deletefile.php
```

```

if (!unlink('testfile2.new')) echo "Could not delete
file"; else echo "File 'testfile2.new' successfully
deleted";
?>

```

- **Form Handling**

PHP is used for form handling. For that purpose the simple form can be designed in XHTML and the values of the fields defined on the form can be transmitted to the PHP script using GET and POST methods. For forms that are submitted via -GET || method, we obtain the form via the

`$_GET` array variable. For forms that are submitted via -POST|| method we obtain the form via the

### **1. `$_POST` array variable.**

2

**Create HTML form with one text box to get user's name. Also write PHP code to show length of entered name when, the HTML form is submitted. BTL3**

**Solution:**

#### **The `$_GET` Function**

- The built-in `$_GET` function is used to collect values from a form sent with `method="get"`
- Information sent from a form with the GET method is visible to everyone (it will be displayed in the browser's URL) and has limits on the amount of information to send (max. 100 characters)
- This method should not be used when sending passwords or other sensitive information. However, because the variables are displayed in the URL, it is possible to bookmark the page
- The get method is not suitable for large variable values; the value cannot exceed 100 characters

#### **The `$_POST` Function**

- The built-in `$_POST` function is used to collect values from a form sent with `method="post"`
- Information sent from a form with the POST method is invisible to others and has no limits on the amount of information to send
- However, there is an 8 Mb max size for the POST method, by default (can be changed by setting the `post_max_size` in the `php.ini` file)

#### **The `$_GET` Function**

##### **Example Form1.html**

```

<html>
<body>
/* form submitted using '_get' method, action specifies next page which is to be loaded when
button is clicked*/
<form action="welcome.php" method="get">
textbox is to take user input Name: <input type="text" name="fname" />
Age: <input type="text" name="age" />

```

```
Submit button is to submit the value <input type="submit" />
</form>
</body>
</html>
```

### **welcome.php**

```
<html>
<body>
$_GET to receive the data sent from Form1.html Welcome <?php echo $_GET["fname"]; ?>.<br
/> You are <?php echo $_GET["age"]; ?> years old!
</body>
</html>
```

### **The \$\_ POST Function**

#### **Example form1.html**

```
<html>
<body>
/* form submitted using _post' method, action specifies next page which is to be loaded when
button is clicked */ <form action="welcome1.php" method="post">
textbox is to take user input Name: <input type="text" name="fname" /> Age: <input type="text"
name="age" />
Submit button is to submit the value to next page <input type="submit" />
</form>
</body>
</html>
```

#### **welcome1.php**

```
<html>
<body>
$_GET to receive the data sent from form1.html Welcome <?php echo $_POST["fname"]; ?>.<br
/>
You are <?php echo $_POST["age"]; ?> years old!
</body>
```

#### **</html> Step 1:**

```
<!DOCTYPE html>
<html>
<head>
<title>HTML-PHP Demo</title>
</head>
<body>
<form method= -post|| action=
-http://localhost/getdata.php|| Name:<input type= -text||

name= -mynamel|| size=||20|| />
<br/>
<input type = -submit|| name=||submit|| value= -Submit|| />
```

	<pre>&lt;/form&gt; &lt;/body&gt; &lt;/html&gt;</pre> <p><b>Step 2:</b></p> <p>The PHP script to display the length of the submitted name is as written below:</p> <pre>&lt;?php print -The name is ; print \$_POST[myname]; \$len=strlen(\$_POST[myname]); print \$len; ?&gt;</pre>
3	<p><b>Explain in details about the various operation involved in MySQL. BTL2</b></p> <p><b>Benefits of using PHP and MySQL:</b></p> <p>PHP is a server side scripting language and it has an ability to create dynamic pages with customized features. Using PHP-MySQL user friendly and interactive web sites can be created. Both PHP and MySQL are open-source technologies that work hand-in-hand to create rich internet applications. The purchased code provides you the encrypted source code to prevent replication or modification, whereas open-source programs encourage users to utilize, scrutinize and customize the code.</p> <p>Due to the availability of these technologies as free of cost, the cost effective web solutions can be created. PHP-MySQL are stable technologies and have cross platform compatibility. Hence the web application developed using these technologies becomes portable. Since HTML can be embedded within the PHP, there is no need to write separate code for web scripting. Open-source coding has been checked and doubled checked by thousands or even millions of people around the world. Hence one can build the reliable web application using these technologies.</p> <p>The PHP has got the support from several content management programs such as WordPress, Joomla, Drupal and so on. It has got a strong support for developing e-commerce applications using the technologies such as Ecommerce, Drupal and so on. The most popular web sites being developed using PHP and MySQL technologies are:</p> <ol style="list-style-type: none"> <li>1. Facebook</li> <li>2. WordPress</li> <li>3. Wikipedia</li> </ol> <p><b>Structured Query Language(SQL)</b></p> <p>MySQL is an open source database product and can be downloaded from the web site <a href="http://dev.mysql.com/downloads/mysql">Http://dev.mysql.com/downloads/mysql</a>. MySQL is a kind of database in which the records are stored in an entity called tables. In the tables the data is arranged in the rows and columns. We can query a database to retrieve particular information. Query is a request or a question for the database. There is a common practice of making use of Structured Query Language(SQL).</p> <p><b>Connecting PHP to MySQL:</b></p> <p>The PHP function mysql_connect connects to the MySQL Server. There are three parameters that can be passed to this function. For example-  <b>mysql_connect("localhost", "root", "mypassword") or die(mysql_error());</b></p>

where  
localhost- Local host on which the MySQL is running  
root- Root  
mypassword- Password  
The database can be selected by using the command mysql\_select\_db. For example: mysql\_select\_db(-test||) will select the database named test.

### **Requesting MySQL Operations:**

#### **1. Creating Database:**

We can create a database using the function mysql\_query. The mysql\_error() function is used to get the error messages if any command gets failed. mysql\_query function in php is used to pass a sql query to mysql database. Syntax:

**mysql\_query(string query[, resource link\_identifier])**

This function returns the query handle for select queries, TRUE/FALSE for other queries, or FALSE on failure.

Example

```
mysql_query(-CREATE DATABASE mydb||, $con)
The mysql_connect() function open a connection to a MySQL Server. Syntax:
```

**mysql\_connect(string server, string username, string password)** Returns a MySQL link identifier on success, or FALSE on failure. Example:

```
$conn=mysql_connect(-localhost||, -root||, -password||);
The mysql_close() function is used to close the database connection. Syntax:
```

**mysql\_close(Connection)**

#### **PHP program for Creating the database:**

```
<?php
$conn=mysql_connect(-localhost||, -root||, -password||); //Make a sql connection
if(!$conn)
{
die(_error in connection'.mysql_error());
}
if(mysql_query(-CREATE DATABASE mydb||, $conn)) //Create a database
{
print -Database Created||;
}
else
{
print -Error Creating database:|.mysql_error();
}
mysql_close($conn); //closing the database
?>
```

#### **1.Selecting the database:**

The database can be selected using the function

**mysql\_select\_db(). Syntax:**

**mysql\_select\_db(string database\_name [, resource link\_identifier])**

where mysql\_select\_db() attempts to select existing database on the server associated with the specified link identifier. It returns TRUE on success, or FALSE on failure.

For example-

```
<?php
//Make a MySQL Connection
$conn=mysql_connect(-localhost:3306/mydb|, -root|,
-mypassword|); if(!$conn)
{die(_error in connection'.mysql_error());
}
//Select a database
mysql_select_db(-mydb|, $conn);
mysql_close($conn); //closing the
database
?>
```

## 2. Counting Number of Rows:

The number of rows present in the table can be obtained using mysql\_num\_rows functions.

**Syntax:**

**int mysql\_num\_rows(resource \$result)**

This returns number of rows in result on success, or NULL on error. Example:

```
<?php
//Make a MySQL Connection
$conn=mysql_connect(-localhost:3306/mydb|, -root|,
-mypassword|); if(!$conn)
{die(_error in connection'.mysql_error());
}
//Select a database
mysql_select_db(-mydb|,
$conn);
$num_rows=mysql_num_rows($result);
//Print number of rows
echo -"Total number of rows are
$num_rows"; mysql_close($conn); //closing
the database
?>
```

## 3. Counting number of fields:

The mysql\_num\_fields() is used to get number of fields of the table.

**Syntax:**

**mysql\_num\_fields(resource\_name)**

It returns the number of fields present in the resource and false on failure. Example:

```
<?php
//Make a MySQL Connection
$conn=mysql_connect(-localhost:3306/mydb|, -root|,
```

```

-mypassword||); if(!$conn)
{die(_error in connection'.mysql_error());
}
//Select a database
mysql_select_db(-mydb|,
$conn);
$result=mysql_query("Select id, name from my_table where id='1'");
echo mysql_num_fields($result);
mysql_close($conn); //closing the database
?>

```

## 2. Creating Table:

Before creating the table a database must be created and within which the table can be created. Note that before creating a table, desired database must be selected.

Example:

```

<?php
$conn=mysql_connect(-localhost|, -root|, -password|); //Make a sql connection
if(!$conn)
{die(_error in connection'.mysql_error());
}
if(mysql_query("CREATE DATABASE mydb|, $conn)) //Create a database
{print "Database Created";
}
else
{print "Error Creating database:".mysql_error();
}
mysql_select_db(-mydb|,$conn); // Before creating a table, database must be selected.
$query="CREATE TABLE my_table (id INT(4), name VARCHAR(20))";
mysql_query($query, $conn);
mysql_close($conn); //closing the database
?>

```

## 3. Inserting Data in table:

For inserting a data into the table we use the INSERT query. For Example

```

$query= "INSERT INTO my_table(id, name) VALUES (1,
'_SHILPA')";
mysql_query($query, $conn); // Execution of Query

```

Here is a PHP script in which insert query is used to insert two records in the table Example:

```

<?php
//Make a SQL Connection
$conn=mysql_connect(-localhost|, -root|,
-password|); if(!$conn)
{
die(_error in connection'.mysql_error());
}
mysql_select_db(-mydb|,$conn);
$query= "INSERT INTO my_table(id, name) VALUES (1, '_SHILPA')";
mysql_query($query, $conn);

```

```
$query=-INSERT INTO my_table(id, name) VALUES (2, 'MONIKA');
mysql_query($query, $conn);
mysql_close($conn); //closing the database
?>
```

Sometimes values that can be inserted in the table can be obtained from some other script and these values might be present in the variables. Insertion of such data can be done using `$_POST` variables. It is as shown below-

Example:

```
<?php
//Make a SQL Connection
$conn=mysql_connect('localhost', 'root',
'password'); if(!$conn)
{
die('error in connection'.mysql_error());
}
mysql_select_db('mydb',$conn);
$query=-INSERT INTO my_table(id, name) VALUES ('$_POST[MyId]', '$_POST[MyName]');
mysql_query($query, $conn);
mysql_close($conn); //closing the database
?>
```

#### **4. Displaying or Retrieving Records:**

For displaying the records present in the database table, we use `SELECT` query. For Example

```
// Execution of Query for displaying the data
$result=mysql_query("SELECT * FROM my_table");
```

The above execution returns a result handle. Then the `mysql_fetch_array()` is used to retrieve a row of data as an array from a MySQL result handle.

**Syntax:**

**`mysql_fetch_array(result, result_type)`**

PHP Script for Displaying records:

```
<?php
//Make a SQL Connection
$conn=mysql_connect('localhost', 'root',
'password'); if(!$conn)
{
die('error in connection'.mysql_error());
}

mysql_select_db('mydb',$conn);
//Execution of Query for displaying the data
$result=mysql_query("SELECT * FROM
my_table"); while($row=mysql_fetch_array($result))
{
echo $row['id'].' - '.$row['name']; // Each record will be displayed
echo "<br/>";
}
mysql_close($conn); //closing the database
?>
```

#### **5. Finding the number of affected rows:**

The mysql\_affected\_rows query is used to get number of affected rows in previous MySQL operation such as INSERT, DELETE, UPDATE queries.

### Syntax:

#### **mysql\_affected\_rows(connection)**

Example:

```
<?php
//Make a SQL Connection
$conn=mysql_connect(-localhost|, -root|,
-password|); if(!$conn)
{
die(_error in connection'.mysql_error());
}
mysql_select_db(-mydb|,$conn);
$query= -INSERT INTO my_table(id, name) VALUES (1, _SHILPA'||;
mysql_query($query, $conn);
$query= -INSERT INTO my_table(id, name) VALUES (2, _MONIKA'|';
mysql_query($query, $conn);
echo -Number of rows affected
are:|.mysql_affected_rows(); mysql_close($conn); //closing
the database
?>
```

### MySQL Functions:

#### **mysql\_connect():**

This function opens a link to a MySQL server on the specified host (in this case it's localhost) along with a username (root) and password (q1w2e3r4/). The result of the connection is stored in the variable \$db.

#### **mysql\_select\_db():**

This tells PHP that any queries we make are against the mydb database.

#### **mysql\_query():**

Using the database connection identifier, it sends a line of SQL to the MySQL server to be processed. The results that are returned are stored in the variable \$result.

#### **mysql\_result():**

This is used to display the values of fields from our query. Using \$result, we go to the first row, which is numbered 0, and display the value of the specified fields.

#### **mysql\_result(\$result,0,"position")):**

This should be treated as a string and printed.

- 4 Write a PHP Script to create a new database table with 4 fields of your choice and perform following database operations. i)insert ii)update iii)Delete BTL3

**Solution:**

We will create a table in the database test. The name of the table is mytable. Then we will insert the record into the table using the INSERT command, update particular field of the record using the command UPDATE and delete the record using the command DELETE.

**PHP Document[DBDemo.php]**

```
<?php
// Make a MySQL Connection
mysql_connect(-localhost, -root, -mypassword) or
die(mysql_error()); mysql_select_db(-test) or die(mysql_error());
echo -Connected to database-;
mysql_query(-CREATE TABLE mytable(id INT NOT NULL AUTO_INCREMENT,PRIMARY
KEY(id), name VARCHAR(30), phone INT, emailId VARCHAR(30)) ) or die(mysql_error());

print<br/>;
echo -Table Created-;
//Insert a row of information into table -example-
mysql_query(-INSERT INTO mytable(name, phone, emailId)
VALUES('abcd', '1111', 'abc@gmail.com') ) or die (mysql_error());
mysql_query(-INSERT INTO mytable(name, phone, emailId)
VALUES('xyz', '2222', 'xyz@gmail.com') ) or die (mysql_error());
mysql_query(-INSERT INTO mytable(name, phone, emailId)
VALUES('Kumar', '3333', 'pqr@gmail.com') ) or die
(mysql_error()); print<br/>;
echo -Data Inserted-;
$result=mysql_query(-SELECT * from
mytable) or die(mysql_error());
print<br/>;
print<b> User
Databse</b>; echo<table
border='1'>;
echo<tr><th>ID</th><th>Name</th> <th>Phone</th><th> Email_ID</th></tr>;
while($row=mysql_fetch_array($result))
{
//Print out the contents of each row into a
table echo<tr><td>;
echo $row[_id];
echo</td><td>;
echo
$row[_name];
echo</td><td>;
echo
$row[_phone];
echo</td><td>;
echo $row[_emailId];
echo</td><tr>;
}
```

```

echo -<table>;
$result=mysql_query("—UPDATE mytable SET phone='5555' where
phone='2222'") or die(mysql_error());
print<br/>;
echo -Data Updated;;
$result=mysql_query("—SELECT * from
mytable") or die(mysql_error());
print<br/>;
print<b> User
Database</b>; echo<table
border='1'>;
echo<tr><th>ID</th><th>Name</th><th>Phone</th><th>Email-ID</th></tr>;
while($row=mysql_fetch_array($result))
{
// Print out the contents of each row into a
table echo<tr><td>;
echo $row['id'];
echo</td><td>;
echo
$row['name'];
echo</td><td>;
echo
$row['phone'];
echo</td><td>;
echo $row['emailId'];
echo</td><tr>;
}

echo -<table>;
$result=mysql_query("—DELETE from mytable where
phone='3333'") or die(mysql_error());
print<br/>;
echo -Data Deleted;;
$result=mysql_query("—SELECT * from
mytable") or die(mysql_error());
print<br/>;
print<b> User
Database</b>; echo<table
border='1'>;
echo<tr><th>ID</th><th>Name</th><th>Phone</th><th>Email-ID</th></tr>;
while($row=mysql_fetch_array($result))
{
// Print out the contents of each row into a
table echo<tr><td>;
echo $row['id'];
echo</td><td>;
echo
$row['name'];
echo</td><td>;
echo

```

	<pre>\$row[_phone']; echo &lt;/td&gt;&lt;td&gt;; echo \$row[_emailId']; echo &lt;/td&gt;&lt;tr&gt;; } echo -&lt;table&gt;;</pre>
5	<p><b>CREATE a HTML form “result.html” with a text box and a submit button to accept registration number of the student. Write a “result.php” code to check the status of the result from the table to display whether the student has “PASS” or “FAIL” status. Assume that the MySql database “my_db” has the table “result_table” with two columns REG_NO and STATUS BTL3</b></p> <p><b>Step 1:</b> Create a database named my_db. Create a table result_table for this database and insert the values in this table. The table is created as follows:</p> <p><b>Step 2:</b> Create an HTML form to accept the registration number, the HTML document is as follows-</p> <p><b>result.html</b></p> <pre>&lt;!DOCTYPE html&gt; &lt;html&gt; &lt;head&gt; &lt;title&gt;STUDENT RESULT&lt;/title&gt; &lt;/head&gt; &lt;body&gt; &lt;form name = -myform  method= -post  action= -http://localhost/php-examples/result.php &gt; &lt;input type= -text  name= -reg_no  /&gt; &lt;input type = -submit  value= -Submit  /&gt; &lt;/form&gt; &lt;/body&gt; &lt;/html&gt;</pre> <p><b>Step 3:</b> Create a PHP Script to accept the registration number. This PHP script will connect to MYSQL database and the status (PASS or FAIL) of the corresponding registration number will be displayed.</p> <p><b>Result.php</b></p> <pre>&lt;?php //Make a SQL Connection \$conn=mysql_connect(-localhost , -root , - ); if(!\$conn) { die(_error in connection'.mysql_error()); } mysql_select_db(-mydb ,\$conn); \$reg_no = intval(\$_POST[_reg_no ]); \$result=mysql_query(-SELECT      REG_NO,      STATUS      FROM      result_table                      where REG_NO=\$reg_no ); while(\$row=mysql_fetch_array(\$result)) {</pre>

```
echo $row[‘_REG_NO’]. -is|.
$row[‘_STATUS’]; echo -<br/>|;
}
mysql_close($conn);
?>
```

**Step 4:** Load the HTML form created in Step 2 and click the submit button by entering some registration number

**UNIT III NETWORKING ESSENTIALS**

**Fundamental computer network concepts - Types of computer networks - - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components**

**PART - A**

1	<b>What is a network?BTL1</b> <p>A network is nothing more than two or more computers connected by a cable or by a wireless connection so that they can communicate and exchange information or data. In other words "Network Means a collection of interconnected computer network of stand-alone computer. Commenting on the computer for the exchange of information. The connection can be over copper, fiber optic, microwave and satellite communications".</p>
2	<b>What are the required network elements?BTL2</b> <p><b>Network Services:</b> At least two individuals who have something to share <b>Transmission Media:</b> A method or pathway for connecting each other „ <b>Protocols:</b> Rules so that two or more individuals can communicate</p>
3	<b>What are the types of networks?BTL1</b> <ul style="list-style-type: none"> <li>• Peer – to – peer: - Allow any entity to both request and provide network services,,</li> <li>• Server – centric: - Places restrictions upon which entity may make requests or service them</li> </ul>
4	<b>What is Protocols?BTL1</b> <ul style="list-style-type: none"> <li>• Rules required helping entities communicate or understand each other.</li> <li><input type="checkbox"/> When both entities formally agrees to use a common language, there established a successful communication protocol.</li> </ul>

5	<p><b>What are network services?BTL1</b></p> <ul style="list-style-type: none"> <li>• File Services,,</li> <li>• Print Services</li> <li>• Message Services</li> <li>• Application Services,,</li> <li>• Database Services</li> </ul>
6	<p><b>What is File Services?BTL1</b></p> <p>Includes network apps designed to efficiently store, retrieve or move data files. Its main functions are</p> <ul style="list-style-type: none"> <li>• File transfer<sup>TM</sup></li> <li>• File storage and data migration<sup>TM</sup></li> <li>• File update synchronization<sup>TM</sup></li> <li>• File archiving</li> </ul>
7	<p><b>What Is TCP/IP?BTL1</b></p> <p>TCP/IP is shorthand for a suite of protocols that run on top of IP. IP is the Internet Protocol, and TCP is the most important protocol that runs on top of IP. Any application that can communicate over the Internet is using IP, and these days most internal networks are also based on TCP/IP.</p>
8	<p><b>What is a WAN?BTL1</b></p> <p><b>A WAN is a data communications network that serves users across a broad geographic area and often uses transmission facilities provided by common carriers such as telephone companies</b></p>
9	<p><b>What is Network equipments?BTL1</b></p> <p>Networking hardware, equipment or computer networking devices, are physical devices which are required for communication and interaction between devices on a computer network. Specifically, they mediate data in a computer network.</p>
10	<p><b>What is Hub?BTL1</b></p> <p>A hub is a “dumb” device that operates at the Physical layer of the OSI model. A hub forwards all signals it receives to all connected network devices. a hub is the most basic networking device that connects multiple</p>

	computers or other network devices together. Unlike a network switch or router, a network hub has no routing tables or intelligence on where to send information and broadcasts all network data across each connection.
11	<b>What is Ethernet? How it works?BTL2</b> The Ethernet card, or adapter, is the component that is actually installed in each computer that connects to the network via Ethernet cable; it is the hardware that the computer uses to transmit and receive data packets across the network and the Internet.
12	<b>State the uses of switches in networking.BTL2</b> Switches are used to connect multiple devices on the same network within a building or campus. For example, a switch can connect your computers, printers, and servers, creating a network of shared resources. The switch, one aspect of your networking basics, would serve as a controller, allowing the various devices to share information and talk to each other.
13	<b>What is wireless local area network?BTL1</b> A wireless local area network (WLAN) is a wireless distribution method for two or more devices that use high-frequency radio waves and often include an access point to the Internet. A WLAN allows users to move around the coverage area, often a home or small office, while maintaining a network connection.
14	<b>What is WWW?BTL1</b> WWW is also known as W3. It offers a way to access documents spread over the several servers over the internet. These documents may contain texts, graphics, audio, video, hyperlinks. The hyperlinks allow the users to navigate between the documents.
15	<b>Define routing.BTL2</b> When a device has multiple paths to reach a destination, it always selects one path by preferring it over others. This selection process is termed as Routing. A default route tells the router where to forward a packet if there is no route found for

	<p>specific destination. In case there are multiple path existing to reach the same destination, router can make decision based on the following information:</p> <ul style="list-style-type: none"> <li>• Hop Count</li> <li>• Bandwidth</li> <li>• Metric</li> <li>• Prefix-length</li> <li>• Delay</li> </ul>
16	<p><b>State multicast routing?BTL2</b></p> <p>Multicast routing is special case of broadcast routing with significance difference and challenges. In broadcast routing, packets are sent to all nodes even if they do not want it. But in Multicast routing, the data is sent to only nodes which wants to receive the packets</p>
17	<p><b>What is switching?BTL1</b></p> <p>Switching is process to forward packets coming in from one port to a port leading towards the destination. When data comes on a port it is called ingress, and when data leaves a port or goes out it is called egress. A communication system may include number of switches and nodes.</p>
18	<p><b>What is bridge?BTL1</b></p> <p>Bridge is used when we need to decouple an abstraction from its implementation so that the two can vary independently. This type of design pattern comes under structural pattern as this pattern decouples implementation class and abstract class by providing a bridge structure between them.</p>
19	<p><b>What are the different types of switching?BTL2</b></p> <p>At broad level, switching can be divided into two major categories:</p> <p><b>Connectionless: The data is forwarded on behalf of forwarding tables. No previous handshaking is required and acknowledgements are optional</b></p> <ul style="list-style-type: none"> <li>• <b>Connection Oriented:</b> Before switching data to be forwarded to destination, there is a need to pre-establish circuit along the path between both endpoints. Data is then forwarded on that circuit. After the transfer is completed, circuits can be kept for future use or can be turned down immediately.</li> </ul>

20.	<p><b>What is difference between a repeater, a hub and a switch?BTL2</b></p> <p>Repeater and hub works at physical layer and switch works at data link layer. Repeater is used to extend the LAN. Hub and switch is used to set up a LAN. Repeater regenerates the signal. Hub is broadcasting device. Switch is point to point devices</p>
21	<p><b>Give the name of a protocol used in each layer of the network.BTL2</b></p> <p>Application layer uses HTTP, Transport layer uses TCP and UDP. Network layer uses ARP, RARP. Data link layer uses PPP, IEEE 802.2 and physical layer uses Ethernet</p>
22	<p><b>What is meant by encapsulation and decapsulation?BTL1</b></p> <p>Encapsulation is used to refer to the process of each layer at the sending computer adding its own header information. Decapsulation is the reverse process of encapsulation, wherein each layer at the receiving computer, interprets the header information sent by its peer layer, takes the required action based on the information and finally removes the header, before passing on the data to the next higher layer.</p>
23	<p><b>Define physical and logical topology.BTL2</b></p> <p>Physical topology defines how the nodes of the network are physically connected. Logical topology dedicated connections between certain selected source destination pairs using the underlying physical topology.</p>
24	<p><b>What is data plane and control plane in network layer?BTL1</b></p> <p>The data plane contains the protocols and mechanisms that allow hosts and routers to efficiently learn how to exchange packages carrying user data. The control plane contains the protocols and mechanisms that enable routers to efficiently learn how to forward packets towards their final destination.</p>

### Part \*B

1.	<p><b>Describe about the Fundamentals Computer Networks BTL2</b></p> <p>Communication means to convey a message, a picture, speech or an idea that is received and understood clearly and correctly by the person for whom it is conveyed. Network is a set of devices connected by media links. The link connecting the devices is often called communication channels. Computer networking consists of two or more computers that are linked in order to share resources, exchange files, or allow electronic communications. The computers on a network may be linked through cables, telephone lines, radio waves, satellites, or infrared light beams. Data communication consists of five elements. They are sender, receiver, message, transmission medium and protocol.</p> <ul style="list-style-type: none"> <li>• <b>Sender :</b> Sender machine creates data and send it to the receiver machine.</li> </ul>
----	--

- Receiver:** Receive data and information from sender
- Message :** The message is the information or data, that is to be communicated. It may consist of text, numbers, pictures, sounds, videos or any combination devices.
- Protocol:** A set of rules that defines how data is formatted and processed on a network.
- Transmission media:** It is a path between sender and receiver .Message is transmitted through this medium.

**Point – to – Point link :** In data communication, the point to point is commonly used to establish a direct connection between two networking devices. Point – to – point networks provide a dedicated link between any two stations. The data packets are sent from source station to the destination.

**Multi-point link :** Multi-point communication means one to many i.e. one source machine communicate with multiple receiver machine.

### Transmission Modes in Computer Networks (Simplex, Half-Duplex and Full-Duplex)

a. Simplex Mode

b.Half-Duplex Mode

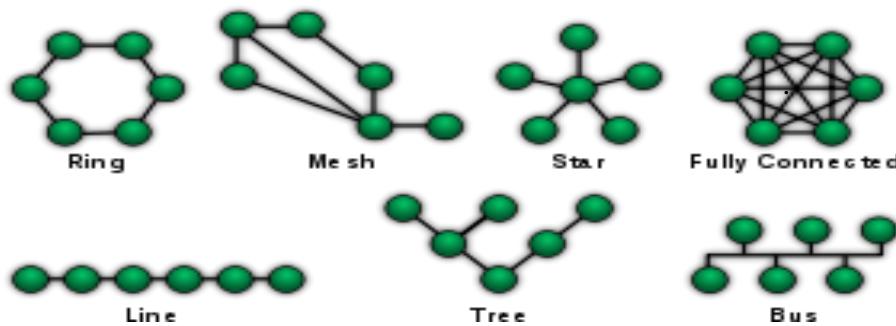
c. Full-Duplex

2.

### Write down the various types of Topologies BTL2

The physical topology of a network refers to the configuration of cables, computers, and other peripherals:

- Mesh
- Star
- Ring
- Bus
- Hybrid

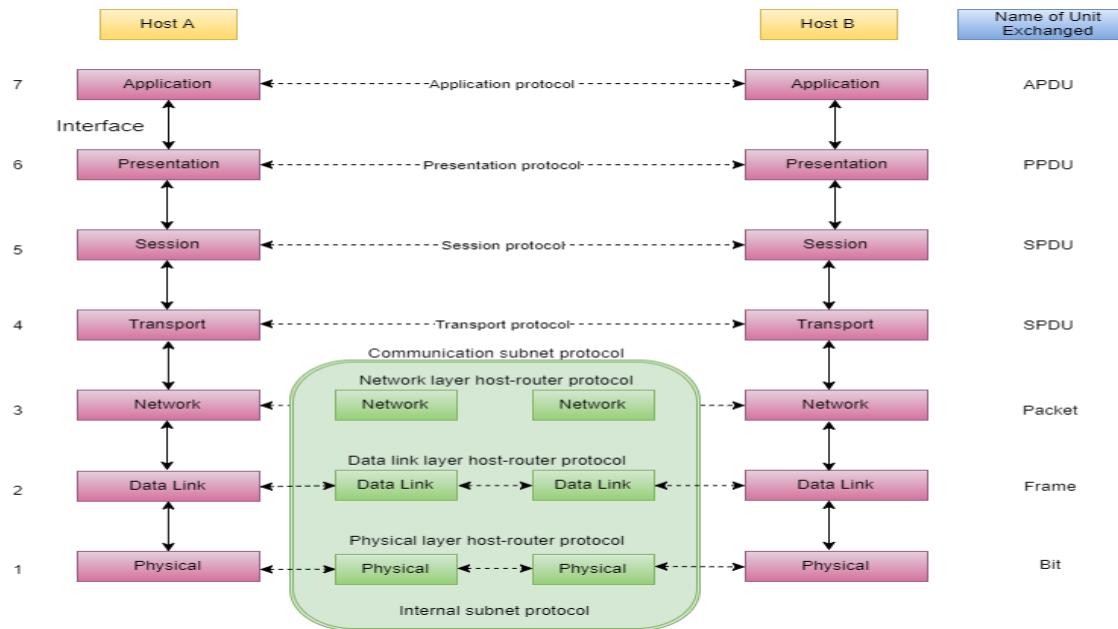


3.

### Explain in details about the OSI Model BTL2

There are n numbers of users who use computer network and are located over the world. So to ensure, national and worldwide data communication, systems must be developed which are compatible to communicate with each other ISO has developed a standard. ISO stands for **International organization of Standardization**. This is called a model for **Open System**

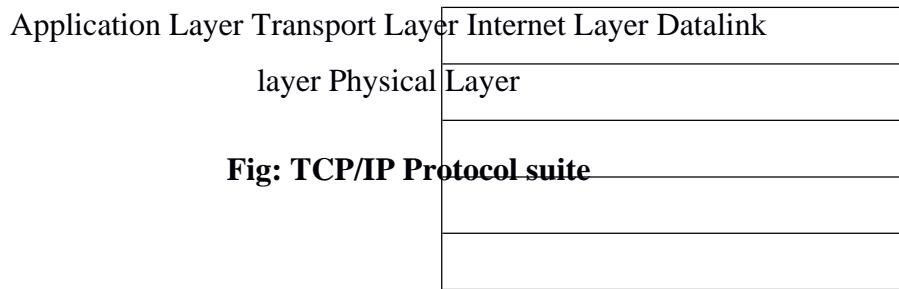
**Interconnection (OSI) and is commonly known as OSI model.**



**4. Explain in details various Types Of Computer Networks. BTL2**

Computer Networks can be categorized depending on their size, distance and the structure namely:  
 LAN (Local Area Network),  
 MAN (Metropolitan Area Network), WAN  
 (Wide Area Network).

**5. Describe briefly about the TCP/IP Model BTL2**



6.	<p><b>Explain in detail about various operation of WLANS - Wireless Local Area Networks BTL2</b></p> <p>A WLAN, or wireless LAN, is a network that allows devices to connect and communicate wirelessly. Unlike a traditional wired LAN, in which devices communicate over Ethernet cables, devices on a WLAN communicate via Wi-Fi.</p> <p>The primary difference is how the data is transmitted. In a LAN, data is transmitted over physical cables in a series of Ethernet packets containing. In a WLAN, data is transmitted over the air using one of Wi-Fi 802.11 protocols</p> <p><b>Hidden Terminal Problem</b></p> <p><b>Exposed Terminal Problem</b></p> <p>WLAN Protocols :</p> <p><b>Multiple Access with Collision Avoidance (MACA)</b> is a slotted media access control protocol used in wireless LAN data transmission to avoid collisions caused by the hidden station problem and to simplify exposed station problem. The basic idea of MACA is a wireless network node makes an announcement before it sends the data frame to inform other nodes to keep silent. When a node wants to transmit, it sends a signal called Request- To-Send (RTS) with the length of the data frame to send. If the receiver allows the transmission, it replies the sender a signal called Clear-To-Send (CTS) with the length of the frame that is about to receive. Meanwhile, a node that hears RTS should remain silent to avoid conflict with CTS; a node that hears CTS should keep silent until the data transmission is complete.</p>

	<p><b>Multiple Access with Collision Avoidance (MACA) for Wireless LAN's</b></p> <p>WLAN data transmission collisions may still occur, and the MACA for Wireless (MACAW) is introduced to extend the function of MACA. It requires nodes sending acknowledgements after each successful frame transmission, as well as the additional function of Carrier sense</p> <p><b>Carrier Sense Multiple Access/Collision Avoidance</b></p> <p>In CSMA/CA, as soon as a node receives a <u>packet</u> that is to be sent, it checks to be sure the channel is clear (no other node is transmitting at the time). If the channel is clear, then the packet is sent. If the channel is not clear, the node waits for a randomly chosen period of time, and then checks again to see if the channel is clear. This period of time is called the backoff factor, and is counted down by a backoff counter. If the channel is clear when the backoff counter reaches zero, the node transmits the packet. If the channel is not clear when the backoff counter reaches zero, the backoff factor is set again, and the process is repeated.</p>
7.	<p><b>Write the working principles of ETHERNET BTL2</b></p> <p>Ethernet refers to the family of Local-Area Network (LAN) covered by the IEEE 802.3 standard that defines what is commonly known as the CSMA/CD protocol. Four data rates are currently defined for operation over optical fiber and twisted-pair cables : 10 Mbps-10 Base-T Ethernet, 100 Mbps-Fast Ethernet, 1000 Mbps-Gigabit Ethernet and 10,000 Mbps-10 Gigabit Ethernet. Ethernet uses a communication concept called datagrams to get message across the network. Ethernet uses a CSMA/CD multiple access algorithm.</p> <p><b>Carrier Sense Multiple Access with Collision Detection (CSMA/ CD)</b></p> <p>When node has data to transmit, the node first listens to the cable to see if a carrier(signal) is being transmitted by another node. This may be achieved by monitoring whether a current is flowing in the cable. The individual bits are sent by encoding them with a 10 clock using Manchester encoding. Data is only sent when no carrier is observed(i.e no current present) and the physical medium is therefore idle.</p> <p>Any node which does not need to transmit, listens to see if other nodes have started to transmit information to it. The collision will result in the corruption of the frame being sent, which will subsequently be discarded by the receiver since a corrupted Ethernet frame will not have a valid 32-bit MAC CRC at the end.</p> <p>If two or more stations have messages to send at the same time and they are separated by significant distances on the bus/channel, each may begin transmitting at roughly the same time without being aware of the other station. The signals from each node will superimpose on the channel and is garbled beyond the decoding ability of the receiving station. This is termed as «collision».</p> <p>When there is data waiting to be sent, each transmitting node also monitors its own transmission. If it observes a collision, it stops transmission immediately and instead transmits a 32-bit jam sequence. The purpose of this sequence is to ensure that any other node which may currently be receiving this frame will receive the jam signal in place of the correct 32-bit MAC CRC, this causes the other receivers to discard the frame due to a CRC error. When two or more transmitting nodes each detect a corruption of their own data (i.e a collision), each responds</p>

	<p>in the same way by transmitting the jam sequence.</p> <p><b>MAC addresses</b></p> <ul style="list-style-type: none"> <li>Every device connected to an Ethernet network has a unique MAC address, assigned by the manufacturer of the network card. Its function is like that of an IP address, since it serves as a unique identifier that enables devices to talk to each other.</li> </ul>
8.	<p><b>Write short notes on WiFi BTL2</b></p> <ul style="list-style-type: none"> <li>WiFi means -Wireless Fidelity-. It is a wireless technology that uses radio frequency to transmit data through the air. The standard for Wireless Local Area Networks (WLANs). It,s actually IEEE 802.11, a family of standards. WiFi is based on the 802.11 standard: 802.11a and 802.11g. WiFi systems are the half duplex shared media configuration, where all stations transmit and receive on the same radio channel.</li> <li>WiFi combines concepts found in CSMA/CD and MACAW, but also offers features to preserve energy.The developers of the 802.11 specifications develop a collision avoidance mechanism called the Distributed Control Functions(DCF). According to DCF, a WiFi station will transmit only when the channel is clear. All transmissions are acknowledged, so if a station does not receive an acknowledgement, it assumes a collision occurred and retires.</li> </ul> <p><b>ISM Band</b></p> <ul style="list-style-type: none"> <li>ISM stands for industrial, scientific and medical. ISM bands are set aside for equipment that is related to industrial or scientific processes or is used by medical equipment.Perhaps the most familiar ISM-band device is the microwave oven, which operates in the 2.4-Ghz ISM band.The ISM bands are license-free, provided that devices are low-power. You don,t need a license to set up and operate a wireless network.</li> <li>WLAN Architecture: <b>Ad-Hoc mode</b> : Peer-to-peer setup where clients can connect to each other directly. Generally not used for business networks.Mobile stations communicate to each other directly. It,s set up for a special purpose and for a short period of time. For example, the participants of a meeting in a conference room may create an ad hoc network at the beginning of the meeting and dissolve it when the meeting ends.</li> </ul> <p>WiFi networks services are as follows:</p> <p><b>Distribution</b></p> <p><b>Integration</b></p> <p><b>Authentication/Deauthentication</b></p> <p><b>Deauthentication</b></p> <p><b>Association</b></p> <p><b>Reassociations</b></p>

### Part \*C

1. Explain in details about various types of Switching process. BTL2

**Switching** is process to forward packets coming in from one port to a port leading towards the destination.

#### Circuit Switching

Three phases:

- Establish a circuit
- Transfer the data
- Disconnect the circuit

#### Message Switching

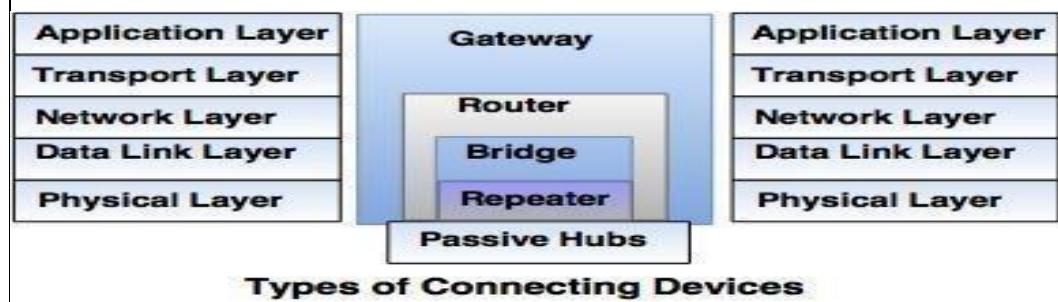
#### Packet Switching

2 Explain in detail about the various types of Network Components BTL2

**Computer network** is a group of two or more computers that connect with each other to share a resource. **Sharing of devices and resources is the purpose of computer network.** You can share printers, fax machines, scanners, network connection, local drives, copiers and other resources.

Major computer network components include:

- Repeater
- Bridge.
- Router
- Gateway
- Network Interface Card (NIC)
- Hub
- Switches



**UNIT IV - MOBILE COMMUNICATION ESSENTIALS**

**Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS**

**PART - A**

1.	<b>What is Mobile Communications?BTL1</b> A wireless form of communication in which voice and data information is emitted, transmitted and received via microwaves. This type of communication allows individuals to converse with one another and/or transmit and receive data while moving from place to place. Some examples include: cellular and digital cordless telephones; pagers; telephone answering devices; air-to- ground telecommunications; and satellite-based communications
2.	<b>What are uses of cell phones?BTL2</b> <ul style="list-style-type: none"> <li>• Voice calling</li> <li>• Voicemail</li> <li>• E-mail</li> <li>• Messaging</li> <li>• Mobile content</li> <li>• Gaming</li> <li>• Personalize your phone –Play music</li> <li>• Take photos or videos</li> <li>• Download and view images</li> </ul>
3.	<b>What is a Cell?BTL2</b> The power of the radio signals transmitted by the BS decay as the signals travel away from it. A minimum amount of signal strength (let us say, $x$ dB) is needed in order to be detected by the MS or mobile sets which may the hand-held personal units or those installed in the vehicles. The region over which the signal strength lies above this threshold value $x$ dB is known as the coverage area of a BS and it must be a circular region, considering the BS to be isotropic radiator. Such a circle, which gives this actual radio coverage, is called the foot print of a cell (in reality, it is amorphous).
4.	<b>How do mobile phone networks work?BTL2</b> A mobile phone is a portable telephone which receives or makes calls through a cell site (base station), or transmitting tower. Radio waves are used to transfer signals to and from the cell phone. Modern mobile phone networks use cells because radio frequencies are a limited, shared resource.

5	<b>What is the concept of frequency reuse?BTL2</b> A mobile network operator or MNO, also known as a wireless service provider, wireless carrier, cellular company, or mobile network carrier, is a provider of wireless communications services that owns or controls all the elements necessary to sell and deliver services to an end user including radio spectrum allocation, network infrastructure, backhaul infrastructure, billing, customer care, provisioning computer systems and marketing and repair organizations
6	<b>What is cellular network?BTL1</b> A cellular network or mobile network is a communication network where the last link is wireless. The network is distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. ✓
7.	<b>What is mobile network?BTL1</b> A cellular network or mobile network is a communication network where the last link is wireless. The network is distributed over land areas called cells, each served by at least one fixed-location transceiver, but more normally three cell sites or base stations.
8.	<b>List few cellular connections?BLT2</b> <ul style="list-style-type: none"> <li>• GSM</li> <li>• CDMA</li> <li>• LTE cellular data networks.</li> </ul>
9.	<b>What is mobile network operator?BTL2</b> A mobile network operator or MNO, also known as a wireless service provider, wireless carrier, cellular company, or mobile network carrier, is a provider of wireless communications services that owns or controls all the elements necessary to sell and deliver services to an end user including radio spectrum allocation, wireless network infrastructure, backhaul infrastructure, billing, customer care, provisioning computer systems and marketing and repair organizations
10.	<b>State handoff.BTL2</b> Handoff occurs when the mobile telephone network automatically transfers a call from radio channel to radio channel as a mobile crosses adjacent cell. Because dropping the call is unacceptable, the process of handoff was created
11.	<b>What are the cellular system components?BTL1</b> The cellular communications system consists of the following four major components that work together to provide mobile service to subscribers <ul style="list-style-type: none"> <li>• public switched telephone network(PSTN)</li> <li>• mobile telephone switching office(MTSO)</li> <li>• cell site with antenna system</li> <li>• mobile subscriber unit(MSU)</li> </ul>

12.	<p><b>What is location management?BTL1</b></p> <p>An agent in the home network, called home agent, keeps track of the current location of the MS. The procedures to keep track of the users current location is referred to as location management.</p>
13.	<p><b>State the difference between hard handoff and soft handoff.BTL2</b></p> <p>In hard handoff a mobile station communicates with one base station at a time. So, when it moves out from one base station to another, first it breaks connection with the existing one before establishing connection with a new base station. In soft handoff a mobile station can communicate with two base stations simultaneously.</p>
14.	<p><b>Define paging.BTL2</b></p> <p>The Mobile Identification Number (MIN) is then broadcast over all the forward control throughout the cellular system. It is known as paging.</p>
15.	<p><b>If you lose your cell phone you would deactivate your SIM. How is this achieved in the GSM architecture?BTL3</b></p> <p>Equipment identity register (EIR) is a database that keeps tracks of handsets on the network using the IMEI. There is only one EIR per network. It is composed of three lists; the white list, gray list, and the black list. The black list is a list of IMEIs that are to be denied service by the network for some reason. Reasons include the IMEI being listed as stolen or cloned or if the handset is malfunctioning or doesn't have the technical capabilities to operate on the network.</p>
16.	<p><b>What is meant by frequency reuse factor in a cellular network?BTL3</b></p> <p>The design process of selecting and allocating channel groups for all cellular base stations within a system is called frequency reuse. It uses radio frequencies over and over again throughout a market with minimal interference, to serve a large number of simultaneous conversations.</p>

17	<p><b>What are the obstacles in mobile communications?BTL2</b></p> <ul style="list-style-type: none"> <li>• Interference</li> <li>• Regulations and spectrum</li> <li>• Low Bandwidth</li> <li>• High delays, large delay variation</li> <li>• Lower security, simpler to attack</li> <li>• Shared Medium</li> <li>• Adhoc-networks</li> </ul>
18	<p><b>What are the Advantages of wireless LAN?BTL2</b></p> <ul style="list-style-type: none"> <li>• Flexibility</li> <li>• Planning</li> <li>• Design</li> <li>• Robustness</li> </ul>
19	<p><b>State the limitations of Mobile Computing.BTL2</b></p> <ul style="list-style-type: none"> <li>• Resource constraints.</li> <li>• Interface</li> <li>• Bandwidth</li> <li>• Dynamic changes in communication environment.</li> <li>• Network issues.</li> <li>• Interoperability issues.</li> </ul> <p><b>Security Constraints</b></p>
	<p style="text-align: center;"><b>Part *B</b></p>
1	<p><b>Write short on Cellular Networks: BTL2</b></p> <p>In terrestrial communication high power transmitters are used so that the area covered is large. For example Radio communication. In mobile or cellular communication, low power transmitters are used. So the area covered is less when compared with terrestrial Communication. So, even for a small location, more number of transmitters are required. The coverage area of a cellular transmitter is called as cell and it is hexagonal in shape.</p> <p><b>Cells:</b></p>

**Frequency:** Frequency is the rate at which the signal repeats [in cycles per second].

**Spectrum:** The spectrum of a signal is the range of the frequency / frequencies that it contains.

**Frequency Reuse:** In a cellular system, each cell has a base transceiver. The transmission power is carefully controlled to allow communication within the cell using a given frequency band by limiting the power at that frequency that escapes the cell into adjacent cells

**Reason for Hexagonal cell concept and not circular structure:**

- a. By using hexagonal concept, we can divide the geographical area into less number of transmitters used is less. In reality, the shape is irregular polygon. If we use circular concept, the hidden areas are not covered properly.
- b. A cell phone carrier typically gets 832 radio frequencies to use in a city. Each cell phone uses two frequencies per call, a duplex channel. So there are typically 395 voice channels per carrier. (The other 42 frequencies are used for control channels).
- c. Therefore, each cell has about 56 voice channels available. In other words, in any cell, 56 people can be talking on their cell phone at one time. With digital transmission methods (2G), the number of available channels increases. For example, a TDMA-based digital system can carry three times as many calls as an analog system, so each cell has about 168 channels available.
- d. Frequency bands: Uplink: 890-915 MHz, Downlink: 935-960 MHz
- e. Frequency range: 50 MHz (25 MHz Up, 25 MHz Down)
- f. Carrier spacing: 200 kHz (but time shared between 8 subscribers)
- g. Duplex distance: 45 MHz(FDD)
- h. Communication between the base station and mobiles is defined by the standard common air interface(CAI)
  1. **Forward voice channel (FVC) :** Voice transmission from base station to mobile.
  2. **Reverse voice channel (RVC) :** Voice transmission from mobile to base station.
  3. **Forward control channels (FCC):** Initiating mobile call from base station to mobile.
  4. **Reverse control channels (RCC):** Initiating mobile call from mobile to base station.

**Channels (frequencies) used in one cell can be reused in another cell some distance**

- away, which allows communication by a large number stations using a limited number of radio frequencies.

**Channel Assignment**

- **Fixed channel assignment (FCA) :** Channels are pre-allocated to the cells during planning phase.
- **Dynamic channel assignment (DCA):** No pre-allocation. When a call comes/arrives at a cell then a channel not in use is selected.
- It requires the MSC to collect real time data, channel occupancy data, traffic distribution, radio signal strength, etc.,
- DCA schemes perform better under non-uniform and low traffic density. FCA performs well under high and uniform traffic.
- In FCA, the area is partitioned into a number of cells, and a number of channels are assigned to each cell according to some reuse pattern, depending on the desired signal

quality. Channel assignment schemes can be implemented in centralized or distributed fashion.

- In a centralized methods, the channels is assigned by a central controller, whereas in distributed methods a channel is selected either by the local base station of the call is initiated by the mobile. Channel assignment based on local assignment can be done for both FCA and DCA method.
- FCA method behave like a number of small groups of servers, while DCA provides a way of making these small group of servers behave like large servers.
- DCA method performs better under low traffic intensity. FCA method becomes superior at high offered traffic, especially in the case of uniform traffic.

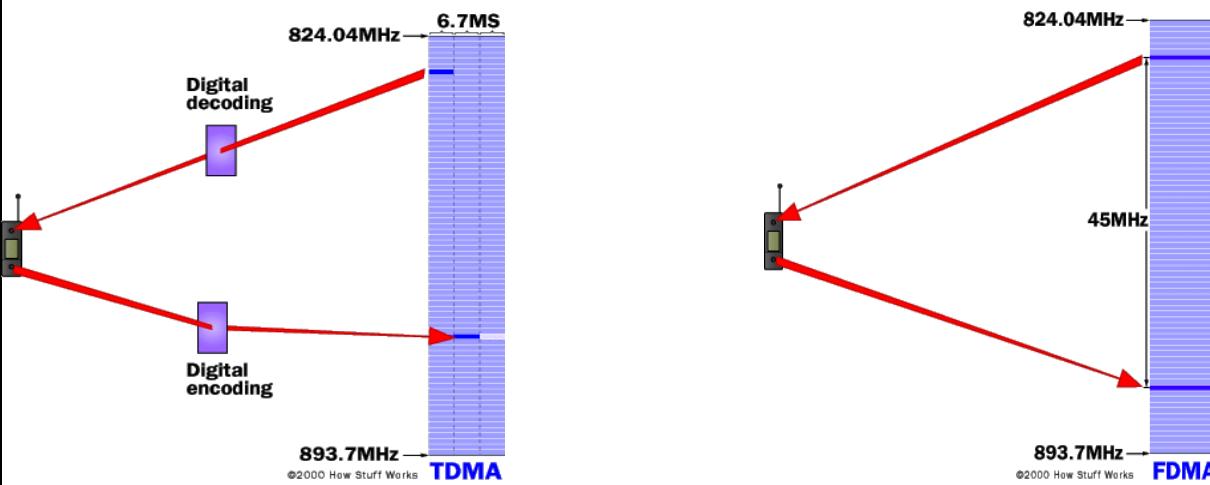
#### Channel Borrowing:

- It is a combination of fixed and dynamic channel assignment. A channel set is nominally assigned to each cell.
- When all the channels in a cell are occupied, the cell borrows channels from other cells to accommodate the incoming new/handoff calls, as long as the borrowed channels do not interfere with the ones used by existing calls. Otherwise the call is blocked.
- The channel borrowing schemes are more flexible in the sense that by moving (borrowing) channels from less busy cells to more busy cells, a balanced performance throughout in the system can be achieved.

2 Write down the various Technologies Based On Sharing BTL2

TDMA: Narrow band means "channels" in the traditional sense. Each conversation gets the radio for one-third of the time. This is possible because voice data that has been converted to digital information is compressed so that it takes up significantly less transmission space.

Therefore, TDMA has three times the capacity of an analog system using the same number



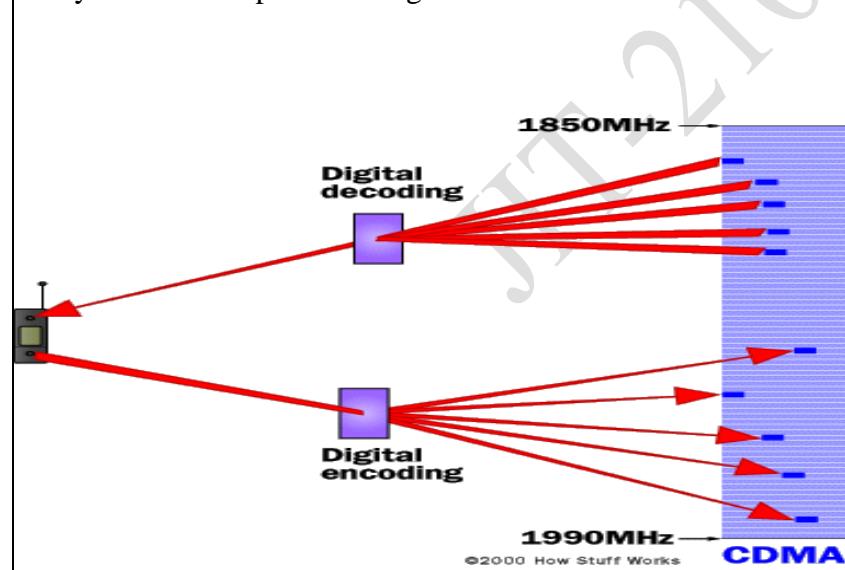
channels. TDMA systems operate in either the 800-MHz (IS-54) or 1900-MHz (IS-136) frequency bands. Time division multiple access (TDMA) is a channel access method (CAM) used to facilitate channel sharing without interference. TDMA allows multiple stations to share and use the same transmission channel by dividing signals into different time slots. Users transmit in rapid succession, and each one uses its own time slot. Thus, multiple stations (like mobiles) may share the same frequency channel but only use part of its capacity. TDMA is used in most 2G cellular systems, while 3G systems are based on CDMA

#### **FDMA:**

**FDMA** separates the spectrum into distinct voice channels by splitting it into uniform chunks of bandwidth. To better understand FDMA, think of radio stations: Each station sends its signal at a different frequency within the available band. FDMA is used mainly for analog transmission. While it is certainly capable of carrying digital information, FDMA is not considered to be an efficient method for digital transmission

#### **CDMA:**

**CDMA** takes an entirely different approach from TDMA. CDMA, after digitizing data, spreads it out over the entire available bandwidth. Multiple calls are overlaid on each other on the channel, with each assigned a unique sequence code. CDMA is a form of spread spectrum, which simply means that data is sent in small pieces over a number of the discrete frequencies available for use at any time in the specified range.



3	Explain in detail about the Cell Phone Network Technologies/ Architecture BTL2
---	--

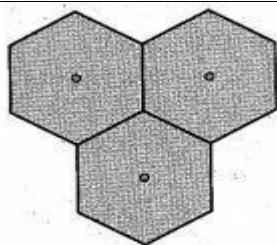


Fig. 4.5.2 (a) Imaginary cell

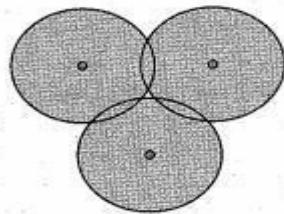


Fig. 4.5.2 (b) Ideal Cell

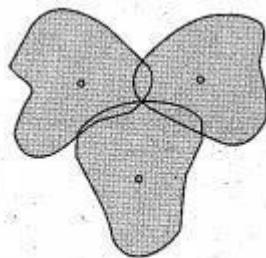
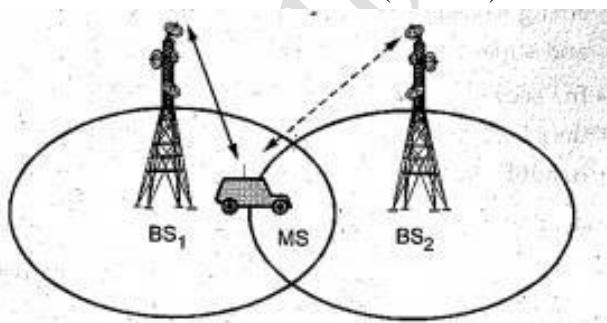


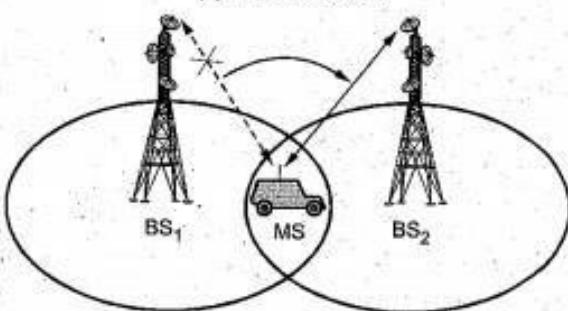
Fig. 4.5.2 (c) Real world cell

- Handoff measurement are as follows:

1. In first generation analog circular systems, signal strength measurements are made by the base station and supervised by the MSC.
2. In second generation systems (TDMA), handoff decisions are mobile assisted, called mobile assisted, called mobile assisted handoff (MAHO).



(a) Before handoff



(b) After handoff

Fig. 4.5.3 Handoff

## Handoff Mechanism

- Base station continuously measure received signal strength indication.
- Based on this measurements decide the Handoff request.
- Once Handoff request is identified, asks adjacent cells to measure the RSSI on that mobile and send the measurements.
- Identifies the candidate cell for Handoff
- Start Handoff
- Handoffs are of two types: Hard and soft handoffs
- The hard handoff can be further divided into two different types: Intra and intercell handoffs
- The soft handoff can also be divided into two different types : multiway soft handoffs and softer handoffs.

#### Frequency Reuse:

- Cellular technology enables mobile communication because they use of a complex two-way radio system between the mobile unit and the wireless network.
- It uses radio frequencies (radio channels) over and over again throughout a market with minimal interference, to serve a large number of simultaneous conversations. This concept is the central tenet to cellular design and is called frequency reuse.
- Most frequency reuse plans are produced in groups of seven cells. Same frequency is reused by each sector.
- The number of cells per cluster defines the reuse pattern and this is a function of the cellular geometry. Cell sizes vary from some 100m upto 35 km depending on user density, geography, transceiver power etc. The hexagonal shape of cells is idealized.
- By limiting the coverage area to within the boundary of the cell, the channel groups may be reused to cover different cells.
- Consider a cellular system which has a total of S duplex channels. Each cell is allocated a group of k channels,  $k < S$ . The S channels are divided among N cells.
- The total number of available radio channels  $S = kN$
- The N cells which use the complete set of channels is called cluster. The cluster can be repeated M times within the system. The total number of channels, C is used as a measure of capacity  $C = MkN = MS$ .
- The capacity is directly proportional to the number of replication M. The cluster size, N, is typically equal to 4, 7 or 12. Small N is desirable to maximize capacity.
- The frequency reuse factor is given by  $1/N$ .

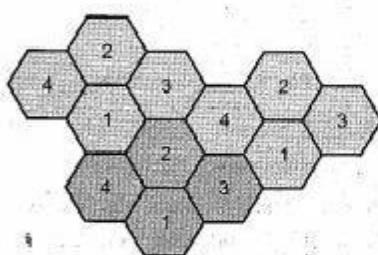


Fig. 4.5.6 (a) Frequency reuse factor =4

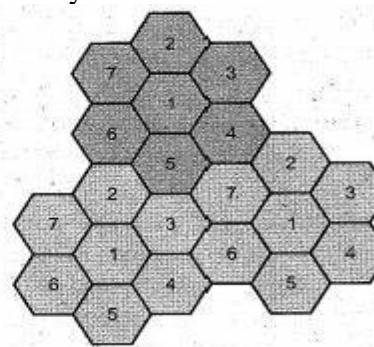
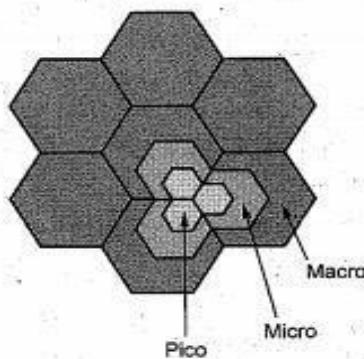


Fig. 4.5.6 (b) Frequency reuse factor =7

### Cell Splitting

- Cell splitting increases the capacity of cellular system since it increases the number of times the channel are reused.
- Cell splitting – defining new cells which have smaller radius than original cells by installing these smaller cells. Capacity increases due to additional number of channels per unit area.
- Cell splitting is process of subdividing a congested cell into smaller cells each with its own base station.
- When traffic density starts to build up and frequency channels in each cell cannot provide enough mobile cells the original cell can be split into smaller cells.
- The original congested bigger cell is called macrocell and the smaller cells are called microcells.
- Capacity of cellular network can be increased by creating micro cells within the original cells which are having smaller radius than macro-cells, therefore the capacity of a system increases because more channels per unit area are now available in a network.
- Splitting of cells causes an unbalanced situation in power and frequency reuse distance. Hence it becomes necessary to split small cells in the neighboring cells. Thus cell splitting affects the neighboring cells.



**Fig. 4.5.7 Cell splitting**

### Part - C

1 Write Down The Various Generation Of Cellular Networks BTL2

#### First generation :

- The first generation (1G) mobile phone networks uses analog signal to transmit the voice calls only between the two transmitters. The main technology of this first generation mobile system was FMDA / FDD and analog FM.
- One example is advanced mobile phone system (AMPS ) used in North America . AMPS is an analog cellular phone system.
- It uses 800 MHz ISM band and two separate analog channels; forward and reverse analog channel s. The band between 82.4 to 849 MHz is used for reverse communication from MS

To BS. The band between 869 to 894 MHz is used for forward communication from BS to MS. Each band is divided into 83230 khz channels.

### **Second generation :**

- Second generation (2G) mobile network is the next stage in the development of wireless technology to overcome the limitation 1G by primarily focusing on transmission of voice and data with digital signal.
- Many digital cellular system rely on Frequency shift keying (FSK) to send data back and forth over AMPS. FSK uses two frequency ,one for 1s and other for 0s.Digital cell phones have contain a lot of processing power.
- 2.5 G network's also brought into the market some popular application your few of which are : Wireless Application Protocol (WAP), General Packet Radio Service (GPRS ),High Speed Circuit Switched Data( HSCSD) ,Enhanced Data Rates for GSM Evolution (EDGE)

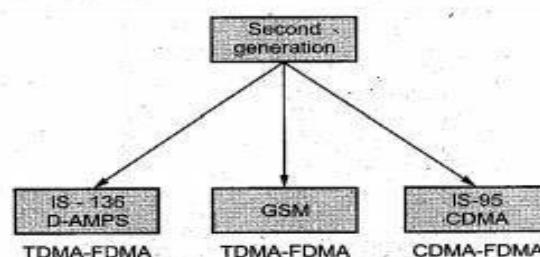
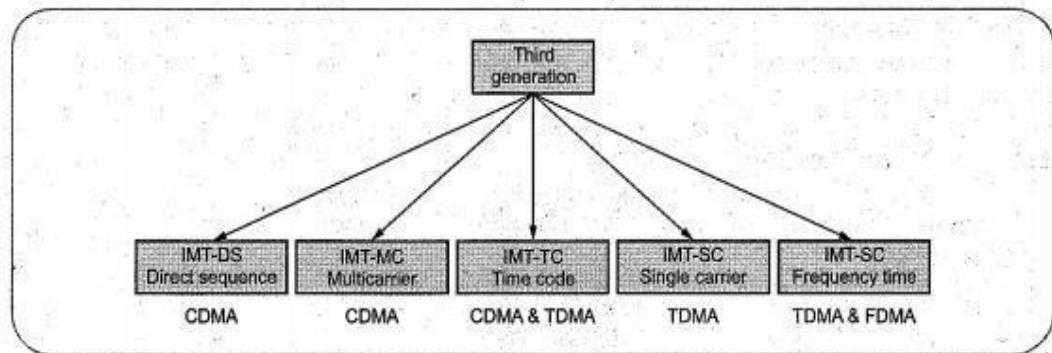


Fig. 4.4.1

### **Third Generation:**

- Third Generation (3G) was arrived because of low speed and incompatible technologies used on previous generations.
- It is based on the International Telecommunication Union (ITU) family of standards under the International Mobile Telecommunication -2000 (IMT2000).
- The main features of (3G) is that it allows Higher data transmission rates and increased capacity for the traditional voice call and high speed data application such as Global roaming, Internet mobile, video conferencing , video calls and 3D gaming.
- 3G networks are wide area cellular Telephone Network which evolved to incorporate high- speed internet access and video telephony . Goal of the 3G technologies are mentioned below:
  - Allow both digital data and voice communication.
  - To facilitate Universal personal communication
  - Listen music ,watch movie ,access internet video conferencing, etc.



### **IMT -2000 defines a set of Technical requirements :**

- Requires high data rates :144 KBPS in all environment and 2Mbps in low- mobility and indoor environments.
- Support symmetrical and asymmetrical data transmission.
- It also support circuit -switched and packet switched based service.

### **Fourth Generation :**

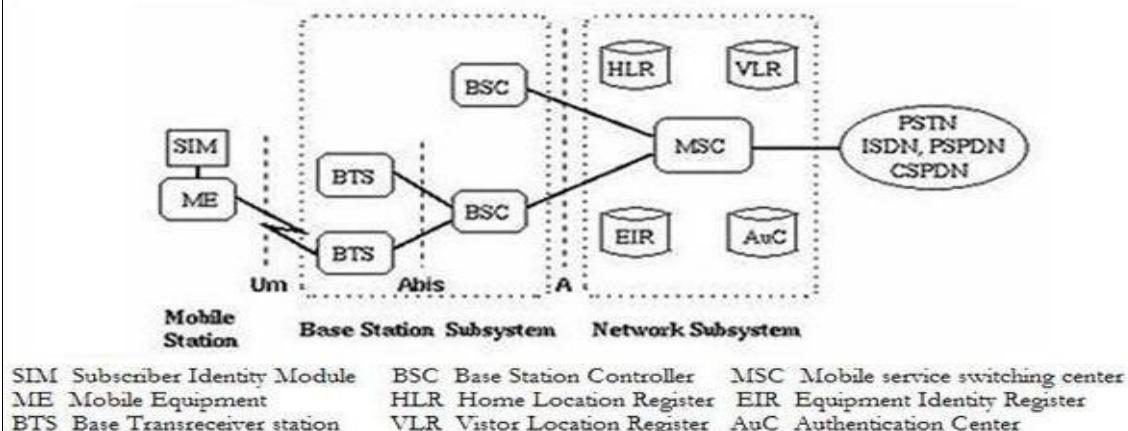
- 4G is called as MAGIC because the user can use the mobile multimedia at anytime anywhere with Global mobility support on integrated wireless solution and customized personal service at high speed data rates than previous generations.
- 4G will be a fully IP -based integrated system .4G will be capable of providing between 100 Mbps and 1 Gbit/s speed both indoor and outdoor with premium quality and high security.

### **Fifth Generation:**

Fifth generation (5G) is a packet switched wireless mobile communication system with extensive area coverage and high throughput. Hence, it is called as real world wireless or wireless world-wide web (WWW).

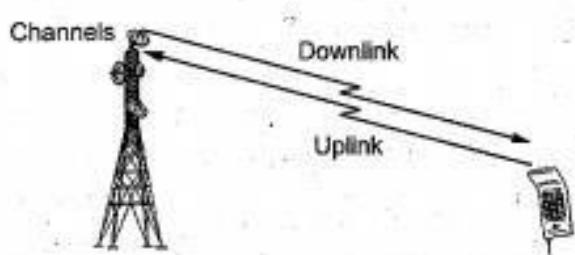
2

### **Explain in detail about the working principles of GSM Architecture BTL2**



### **GSM Channels**

- Physical channel corresponds to a time slot on a frequency carrier. There are 8 physical channels per carrier in GSM. Physical channel can be used to transmit speech, data or signalling information.
- The channel from the base station to the mobile unit is known as the downlink or forward channel. The channel from the mobile unit to the base station is known as the uplink or reverse channel.



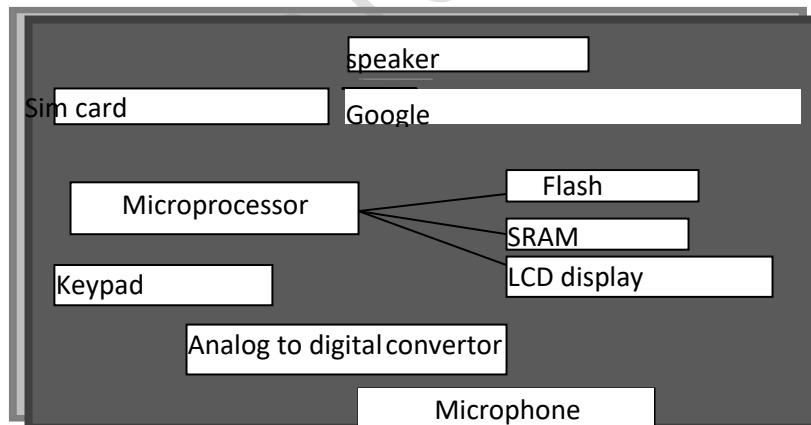
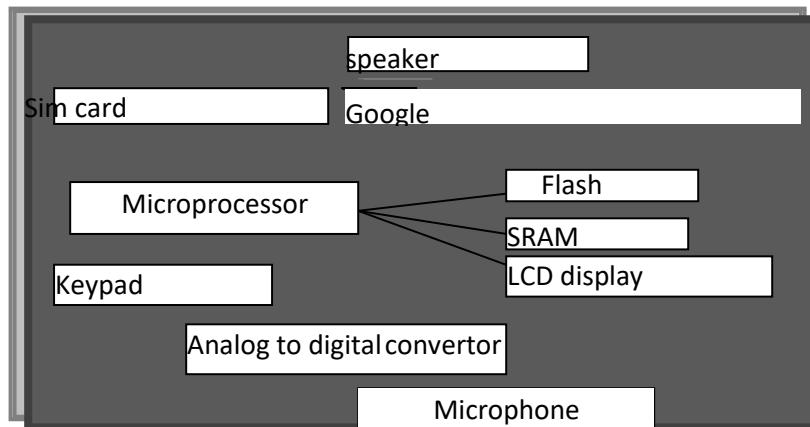
**Fig. 4.4.6 GSM channel**

- **Physical channel:** Each timeslot on a carrier is referred to as a physical channel.
- **Logical channel:** Variety of information is transmitted between the MS and BTS. GSM logical channels consist of two types : Control channels and traffic channels.
- **Control channels:** Control channels are subdivided into three types: Broadcast Control Channel, Common Control Channel and Dedicated Control Channel.
- Channels used for communication between the MS and BSS when a call is in progress.
- Control channels used by idle mode mobiles to exchange signaling information, required changing to dedicated mode.
- Mobiles in dedicated mode monitor the surrounding Base Stations for handover and other information. Control Channels include:
  - 1) Broadcast Control Channel (BCCH) serves for BS identification, broadcasts and frequency allocations.
  - 2) Frequency Control Channel (FCCH) and Synchronization Channel (SCH)- used for synchronization, and physical layer definition ( time slots, burst time)
  - 3) Random Access Channel (RACH) used by mobile to request access to the network.
  - 4) Paging Channel (PCH) used for locating the mobile user.

Access Grant Channel (AGCH) used to obtain a dedicated channel. (Following the request of RACH)

### 3 Describe in details various function involved in Digital Cell Phone Components BTL2

- Cell phone and said is composed of two components: **Radio Frequency (RF)** and **baseband**. RF is the mode of communication for wireless Technologies of all kinds including cordless phones, Radar, ham radio, GPS and radio and television broadcast. RF waves are electromagnetic waves which propagate at the speed of light.
- Base band:** In telecommunications, it is the frequency range occupied by a message signal prior to modulation it can be considered as a synonym to low -pass.



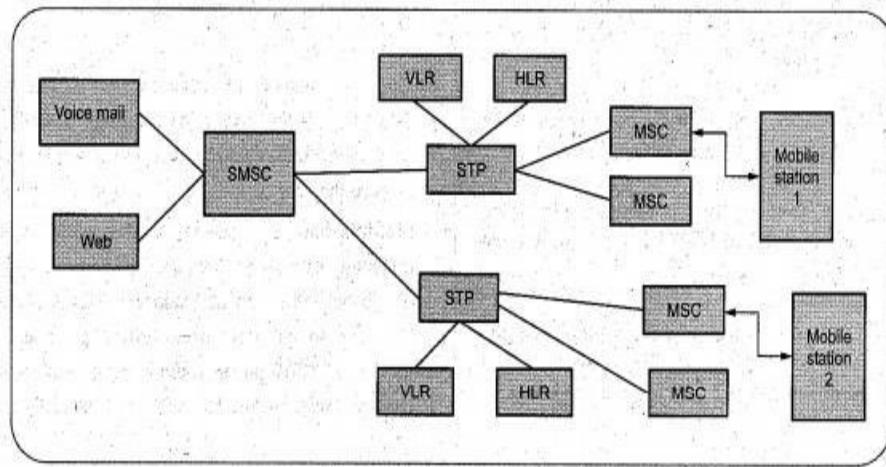
- Mobile phone contains SMD components ,microprocessor ,Flash Memory etc., In addition to the circuit board, mobile phone also as Antenna ,Liquid crystal display( LCD ), keyboard ,microphone , speaker and battery.
- Mobile devices contain nonvolatile and volatile memory volatile memory (i.e, RAM) is used for dynamic storage and its content or lost when power is drained from the mobile device. Nonvolatile memory is persistent as its contents are not affected by laws of power or overwriting data upon reboot. Mobile devices typically contain one or two different type of non-volatile Flash Memory. These types are NAND and NOR. NOR flash as faster read times, slower write times than NAND and is nearly immune to corruption and bad blocks while allowing random access to any memory location.
- NAND Flash Memory contains PIM data, graphics, and audio, video and other user files. NAND flash memory may leave multiple copies of transaction based files due to

wear leveling algorithms and garbage collection routines. Since NAND Flash Memory cells can be re-used for only a limited amount of time before they become unreliable ,wear leveling algorithms are used to increase the lifespan of flash memory storage ,by arranging data so that erasures and rewrite are distributed evenly across the SSD.

- When your mobile phone transmits audio it applies an oscillating electric current to the mobile phone antenna. The mobile phone antenna then emits corresponding electromagnetic waves, which are also known as radio waves. To receive calls the mobile phone antenna intercepts an electromagnetic wave of a particular frequency.
- Mobile phone antennas transmit signals to radio Towers and receive signals back simultaneously. In a cellular network the towers are distributed over portion of land called cells .Each cell of land contains at least one Radio tower. Each cell is also assigned a number of frequencies which correspond to Radio base stations. Other cells can use the same frequencies as long as they are not adjacent. Mobile phones uses following components:
- **Digital signal processor:** It is generally rated as having 40 MIPS( millions of instructions per second ) to conduct for calculation of signal manipulation at high speed. This chip deals with the both compression and decompression of the signal.
- **Microprocessor:** It performs command and control signaling with the base station, and coordinates the rest of functions on the board.
- **Flash memory and ROM chips** of the mobile phone acts as a storage location for the phone .The power and radio frequency section of the phone, phone recharging and power management act are controlled by this chip.
- **SIM card** (Subscriber Identification module (SIM)) is a type of Smart Card used in mobile phone. The SIM is a detachable Smart Card containing the user's subscription information and phone book.
- Mobile phones have special code associated with them. these include:
- **Electronic serial number (ESN):** It is a unique 32 bit number programmed in the phone.
- **Mobile identification number (MIN):** It is 10 digit number derived from the phone's number.
- **System Identification Code ( SID ) :** It is unique 5 digit number that is assigned to each carrier by the FCC.

ESN is a permanent part of the phone while MIN and SID codes are programmed in the phone when your service plan is selected and activated

#### SHORT MESSAGE SERVICE



The mobile station is powered on and registered with the network.

**Step 2:** The MS transfers the SMS to the MSC.

**Step 3:** The MSC interrogates the VLR to verify that the message transfer does not violate the supplementary services invoked or the restrictions imposed.

**Step 4:** The MSC send the short message to the SMSC using the forward short message operation.

**Step 5:** The SMSC delivers the short message to SME (acknowledgement is optional).

**Step 6:** The short message is submitted from the ESME(External Short Message Entity) to the SMSC.

**Step 7:** After completing its internal processing, the SMSC interrogates the HLR.

**Step 8:** The SMSC send the short message to the MSC using forward short message operation.

**Step 9:** The MSC retrieves the subscriber information from the VLR. This operation may include an authentication procedure.

**Step 10:** The MSC transfers the short message to the mobile station.

**Step 11:** The MSC returns to the SMSC the outcome of the forward short message operation.

**Step 12:** If requested by the ESME, the SMSC returns a status report indicating delivery of the short message.

**Step 13:** The SMSC acknowledges to the MSC the successful outcome of the forward short message operation.

## 1. VOICE CALLS

Cell Phones are used to

- Store contact information
- Make task or to-do lists
- Send or receive e-mail
- Get information (news, entertainment, stock quotes) from the Internet
- Play games
- Watch TV
- Send text messages
- Take photos and videos

## 2. MULTI -BAND AND MULTI-MODE PHONES

- A band is a portion of the RF spectrum with the distinct propagation characteristics and/or requiring radios with distinct technological characteristic.

- A portion of the RF spectrum allocated for a specific purpose. For example: ISM (multiple), cellular, PCS, Television (multiple). A radio which is a multiband, works in multiple bands with or no modification.
- Mode is method of communication. The PCS defines bands and constrains the allowed mode in each band. Radios traditionally use a single mode because they are typically used for just one thing.
- Multiple bands: A phone that has multiple band capability can switch frequencies. For example, a dual band TDMA phone could use TDMA services in either an 800-MHz or a 1900MHz system. A quad band GSM phone could use GSM service in the 850-MHz, 900- MHz, 1800-MHz or 1900-MHz band.

### Why Multiband /Multimode Radio (MMR)?

- **Military:** Interoperability a perpetual problem, becoming particularly acute with the advent of rapid joint service ops in the 1980s. Primary instigators for the software – defined radio (SDR), but the underlying motivation is to have multiband/multimode capabilities.
- **Public safety:** Analogous to military application, except interest in interoperable radio is much more recent and cost is much bigger issue.
- -All-in-ones -and personal digital assistants (PDAs).
- Dynamic spectrum and new paradigms for spectrum management. Multiband/multimode radio is enabling technology for these things, however, white space seek/detect is a new application.

**UNIT V APPLICATION ESSENTIALS**

**Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications**

**PART - A**

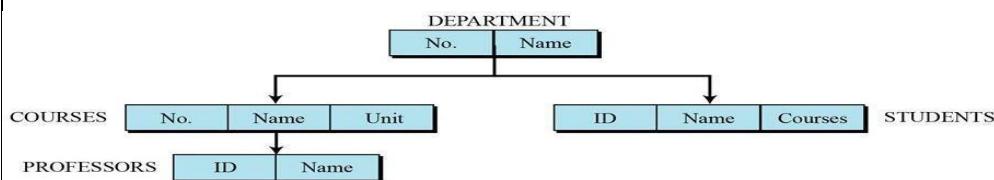
1.	<b>What is database?BTL1</b> <p>A database is a collection of information that is organized so that it can be easily accessed, managed and updated. Data is organized into rows, columns and tables, and it is indexed to make it easier to find relevant information. Data gets updated, expanded and deleted as new information is added. Databases process workloads to create and update themselves, querying the data they contain and running applications against it.</p>
2.	<b>What are database application?BTL2</b> <p>A database application is a computer program whose primary purpose is entering and retrieving information from a computerized database. Early examples of database applications were accounting systems and airline reservations systems.</p>
3.	<b>Define multimedia.BTL2</b> <p>Computer-based techniques of text, images, audio, video, graphics, animation, and any other medium where every type of information can be represented, processed, stored, transmitted, produced and presented digitally.</p>
4.	<b>State the characteristics of multimedia.BTL2</b> <p>Multimedia systems must be computer controlled</p> <ul style="list-style-type: none"> <li>• Multimedia systems are integrated.</li> <li>• The information they handle must be represented digitally.</li> </ul> <p>The interface to the final presentation of media is usually interactive</p>
5.	<b>What is interactive multimedia?BTL1</b> <p>Interactive multimedia, any computer-delivered electronic system that allows the user to control, combine, and manipulate different types of media, such as text, sound, video, computer graphics, and animation.</p>
6.	<b>What is personal information system?BTL1</b> <p>The Personnel Information system is a Computer based system for maintenance of the Service Registers of individuals in an organization. The details pertaining to personnel, postings, qualifications, departmental tests passed, training attended, family details etc are stored in this system.</p>

7.	<p><b>Define information retrieval.BTL2</b></p> <p>Information Retrieval is finding material of an unstructured nature that satisfies an information need from within large collections.</p>
8.	<p><b>Explain difference between data and information.BTL3</b></p> <p>Data: It is the raw fact. For its retrieval it needs to be fully mentioned. If the file name or the document name is not known or is case sensitive, there are chances for the system to fail and do not retrieve any document.</p> <p>Information: Information is processed data. For its retrieval partial information is enough for its evaluation. Hence, the system never fails. Examples of information are a piece of paper on a table, a book in the shelf, a bubble-sort algorithm.</p>
9.	<p><b>List and explain components of IR block diagramBTL1</b></p> <ul style="list-style-type: none"> <li>• Input – Store Only a representation of the document</li> <li>• A document representative – Could be list of extracted words considered to be significant.</li> <li>• Processor – Involve in performance of actual retrieval function</li> <li>• Feedback –Improve</li> <li>• Output – A set document numbers.</li> </ul>
10.	<p><b>What do you mean information retrieval models?BTL2</b></p> <p>A retrieval model can be a description of either the computational process or the human process of retrieval: The process of choosing documents for retrieval; the process by which information needs are first articulated and then refined</p>
11.	<p><b>What is meant by evolution in Social Networks?BTL1</b></p> <p>Visual representation of social networks is important to understand the network data and convey the result of the analysis. Signed graphs can be used to illustrate good and bad relationships between human's location-based interaction analysis, social sharing and filtering, recommender systems development, and link prediction and entity resolution.</p>

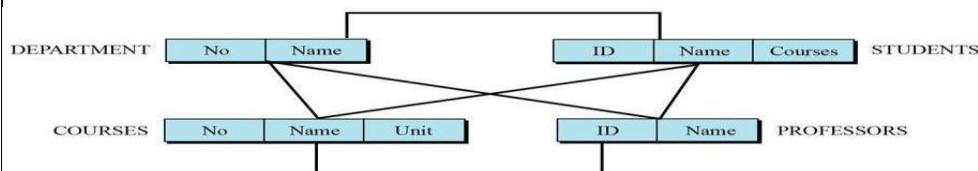
12.	<p><b>Define data and information. Data.BTL2</b></p> <p>Raw facts such as an employee's name and number of hours worked in a week, inventory part numbers or sales orders.</p> <p><b>Information:</b></p> <p>A collection of facts organized in such a way that they have additional value beyond the value of the facts themselves.</p>
13	<p><b>What is the role of information system in today's competitive business environment?BTL2</b></p> <ul style="list-style-type: none"> <li>• Data Processing</li> <li>• Management Reporting</li> <li>• Decision support</li> <li>• Strategic and End User Support</li> <li>• Global Internet working</li> </ul>
14	<p><b>What is the role of information system in an organization?BTL2</b></p> <ul style="list-style-type: none"> <li>• Focuses on competitive priorities</li> <li>• Support business processes and operations</li> <li>• Provide access to information</li> <li>• Enhance communication</li> <li>• Provide decision assistance</li> </ul> <p>Supports strategies for competitive advantage</p>
15	<p><b>What is interactive application?BTL1</b></p> <p>An interactive application is a collection of objects intended for performing certain task when user triggers the command. Typical examples of interactive web applications are online course registration system, online shopping system and so on.</p>
16	<p><b>List the steps involved in atypical application development life cycle.BTL3</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Understand data items and the data dictionary</li> <li><input type="checkbox"/> Understand the table design</li> <li><input type="checkbox"/> Understand business view design</li> </ul> <p><b>Understand report design</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Understand data structure design</li> <li><input type="checkbox"/> Understand system function</li> </ul>

17	<p><b>What are the advantages of DBMS?BTL2</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Reduced data redundancy</li> <li><input type="checkbox"/> Data consistency</li> <li><input type="checkbox"/> Sharing of data</li> <li><input type="checkbox"/> Data integrity</li> <li><input type="checkbox"/> Improved security</li> <li><input type="checkbox"/> Improved security</li> </ul>
18	<p><b>What is data model in database?BTL1</b></p> <p><b>The data model in Database Applications describes the logical structure of database, relationship between the database stored in database and various constraints on data</b></p>
19	<p><b>What is Personal Information System?BTL1</b></p> <p>Personal information management is a set of activities in which people perform in order to acquire, organizing, maintain, retrieve and use personal information such as documents, web page, email messages every day to accomplish the assigned task.</p>
20	<p><b>What are the advantages of using a DBMS?BTL2</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Controlling redundancy</li> <li><input type="checkbox"/> Restricting unauthorized access</li> <li><input type="checkbox"/> Providing multiple user interfaces</li> <li><input type="checkbox"/> Providing backup and recovery</li> <li><input type="checkbox"/> Enforcing integrity constraints</li> </ul>
<b>Part *B</b>	
1	<p><b>Write the Steps for creating Simple Interactive Web Applications BTL2</b></p> <ol style="list-style-type: none"> <li><b>1. Understanding Data Items and the Data dictionary</b></li> <li><b>2. Understanding the Table Design</b></li> <li><b>3. Understanding Business View Design</b></li> <li><b>4. Understanding Form Design</b></li> <li><b>5. Understanding Report Design</b></li> <li><b>6. Understanding Data Structure Design</b></li> <li><b>7. Understanding Event Rules Design:</b></li> </ol> <p>Perform mathematical calculation.</p> <p>Pass data from one field in the form to another field in another form. Interconnect two forms.</p>

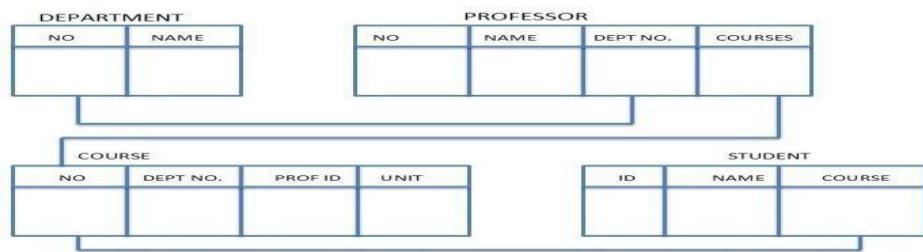
	<p>Hide and display the controls using system functions. Assign the value or an expression to particular field.</p> <p>Creation of variables or programmer defined field at run time. Process table input and output, validate data and retrieve record.</p> <p><b>8. Understanding system Functions:</b></p>
2	<p><b>Write short notes on Simple Database Applications BTL2</b></p> <p><b>Definition:</b> Database is an organized collection of data. A database management system (DBMS) is a computer software application that interacts with the user, other applications and the database itself to capture and analyze data.</p> <p><b>Examples:</b> MS-Access, Oracle, MySQL</p> <p><b>Characteristics of Database Applications</b></p> <ul style="list-style-type: none"> <li>1. Consistency: DBMS provide greater consistency to the forms of data storage.</li> <li>2. Support for Query Language – To retrieve and manipulate the data efficiently</li> <li>3. Multiuser Environment: Simultaneous access of the database without creating conflicts.</li> <li>4. Less Data Redundancy:</li> <li>5. Relationship among Data</li> <li>6. Security</li> </ul> <p><b>Advantages of DBMS</b></p> <ul style="list-style-type: none"> <li>1. Reduced Data redundancy</li> <li>2. Data consistency</li> <li>3. Sharing of data</li> <li>4. Centralized database</li> <li>5. Data Integrity</li> <li>6. Improved Security</li> <li>7. Use of Standards</li> <li>8. Backup and Recovery</li> <li>9. Increased productivity</li> <li>10. Increased Concurrency</li> <li>11. Improved Maintenance</li> </ul> <p><b>Disadvantages of DBMS:</b></p> <ul style="list-style-type: none"> <li>• Complexity – Difficult to implement</li> <li>• Size - Large storage spaceCost - The multiuser database management system is very expensive.</li> </ul> <p><b>Data Models</b></p> <p>They describe the logical structure of a database, relationship between the database stored in database and various constraints on data.</p> <p><b>Importance of Data Model</b></p> <ul style="list-style-type: none"> <li>1. End users have different view for data.</li> <li>2. Data model organizes data for different users.</li> </ul> <p><b>Types of Data Model:</b></p> <p>2. Hierarchical Model</p>



### 1. Network Model:



### Relational Model



3. **Describe about E-R Model BTL2  
Components of ERD Entity**

**Relationship**

**Attribute**

**Notations used in ER Diagram Entity**

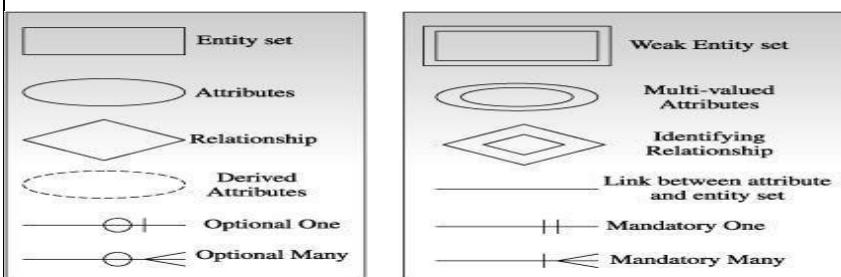
**Weak Entity**

**Attribute Derived**

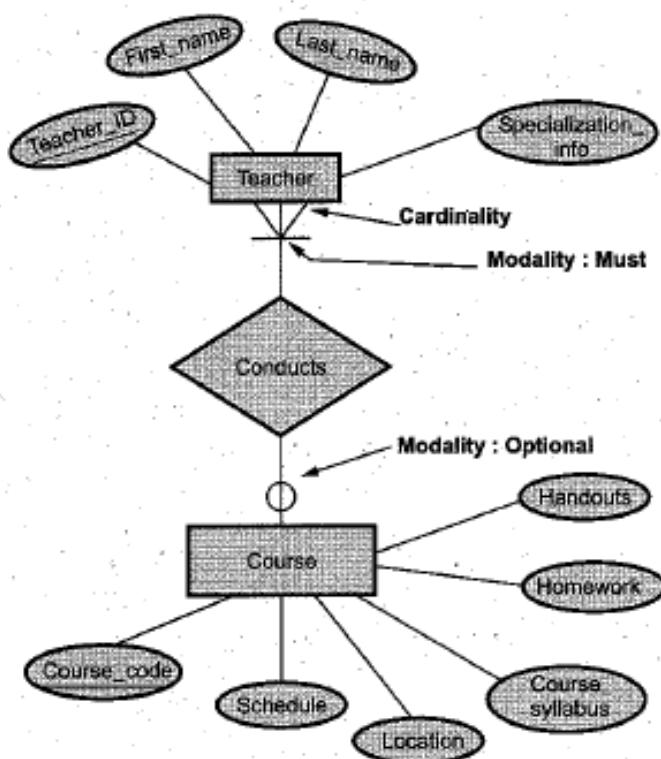
**attribute Key attributes**

**Multivalued attribute**

**Relationship**



Example: Draw an ER diagram for the relationship of teacher, and courses. Also specify the association, cardinality and modality

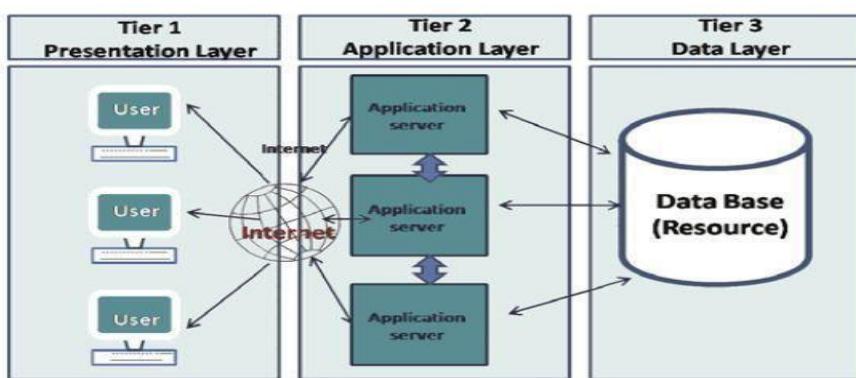


#### 4. Explain in details about the Architecture of Database Systems: BTL2

The database system architecture represents the structure and layout of the data stored in it. The architecture of database system can be from single tier to multitier. The multi-tiered system divides the whole system into multiple modules. Each of these individual modules can be independently altered or modified.

##### Database Tier:

This is the layer at which the actual database resides. In this layer, all the tables, their mappings and the actual data present. When you save your details from the front end, it will be inserted into the respective tables in the database layer, by using the programs in the application layer. When the



Data Independence



### Data Dictionary:

**Concept:** Data dictionary contains information about database itself. The data dictionary thus contains the **metadata** i.e. data about data. Following types of information is stored in data dictionary.

- Definition of database objects such as tables, views, constraints, clusters, procedures, functions, triggers
- Column name
- Data type information
- Amount of space required to store the data object
- Default field values
- Access rights
- Database usernames – Schema information
- Last updated or accessed information

1. Primary Key
2. Candidate Key
3. Foreign Key
4. Composite Key

5

### Explain in details about the MULTIMEDIA APPLICATIONS BTL2

The word multimedia means more than one media for conveying information. The multimedia can be defined as:

**Definition:** Computer- based techniques of text, images, audio, video, graphics, animation , and any other medium where every type of information can be represented, processed, stored, transmitted, produced and presented digitally.

#### Examples:

Some of the important programs are listed below in some categories. They are:

- Maya, Flash, Blender, comes mainly under graphics category.

- Interactivity category basically includes MySQL, AJAX, Flash and Flex and PHP.
- Audio category is of sound slides, Pro-tools, Adobe Auditions and more.
- Similarly programs in video category are Canopus Edius, i Movie, Flash Video Encoder, Final Cut Pro.
- Text programs are like Word press, InDesign, and Dream Weaver.

### **Components of Multimedia:**

#### **Uses of Multimedia:**

- 1. Education:**
- 2. Training:**
- 3. Business:**
- 4. Games and Entertainment:**

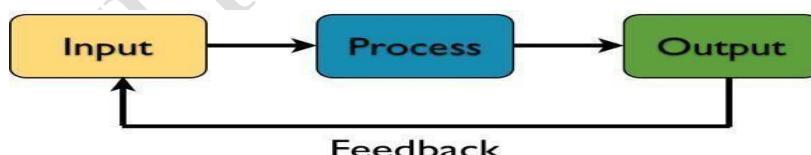
### **Part \*C**

#### **1 Describe in details about the Information System BTL2**

**Definition:** An Information System (IS) is a set of interrelated components that collect, manipulate, store and disseminate data and information and provide a feedback mechanism to meet an objective.

#### **Examples:**

- **1. Supply Chain Management:**
- **2. Customer Relationship Management:**
- **3. Geographic Positioning System (GPS):**
- **4. Enterprise Resource Planning (ERP):**



#### **Characteristics of Information System:**

- **Accessibility :** Information present in the information should be easily accessible by authorized users.
- **Accurate:** The information must be accurate and error free.
- **Complete:** Information present in the information system must be complete so that it will satisfy all the queries of its users.
- **Relevant:** The relevant information is important for the decision maker.
- **Reliable:** This is very important characteristics of the information system. The reliable information is trusted by its users. The reliability of information depends upon the sources of data collection for the information systems.
- **Secure:** The information systems must be secure and prevent any unauthorized access to it.
- **Simple:** The information system must be very simple to handle and not very complex. It should not present the information system with too many details whereby the decision maker is unable to determine what is really important.

**Timely:** The information in the information system must be delivered in timely manner

- whenever it is required.

- **Economical:** Information must be economical to produce.
- **Verifiable:** The information must be verifiable, that means one can check it to make it sure that information available in the information system is correct.

### **Components of Information Systems:**

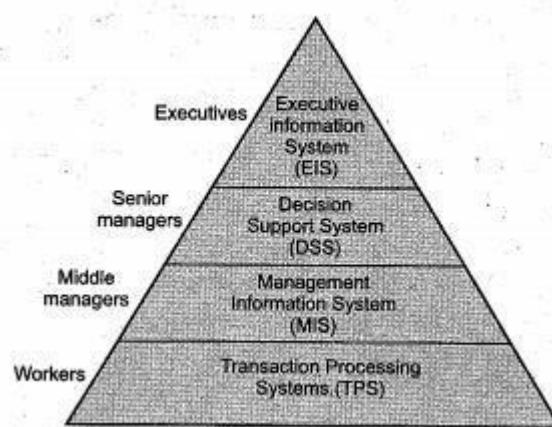
**Hardware:** Computer-based information systems use computer hardware, such as processors, monitors, keyboard and printers.

**Software:** These are the programs used to organize process and analyze data.

**Databases:** Information system work with data, organized into tables and files.

**Network:** Different elements need to be connected to each other, especially if many different people in an organization use the same information system.

**Procedures:** These describe how specific data are processed and analyzed in order to get the answers for which the information system is designed.



## **2 Do the Design and Development of Information System using Financial Analysis system BTL3**

### **1. Feasibility study:**

- The aim of a feasibility study is to see whether it is possible to develop a system at a reasonable cost. At the end of the feasibility study a decision is taken whether to proceed or not.
- A feasibility study contains the general requirements of the proposed systems. It may be that development of a new system is not needed instead an update of the existing is enough.

### **2. Requirement Analysis:**

- This is very important part in the development of an Information System and involves looking at an organization or system and finding out how information is being handled at the moment.
- The stage where users and IT specialists work together to collect and comprehend the business requirements. Based on requirements, both will work on the design and discuss the tasks to be done.
- The requirement analysis document is prepared at the end of this stage.

### **3. Design:**

- At, this stage the systems blueprint is created.
- The technical architecture is designed which includes telecommunications, hardware and software suited for the system.

- The design process include: Outputs, Inputs, File Design, Hardware, Software
- The system design should be done for : user interface, data design, process design

#### **4. Development and Testing:**

- Any new system needs to be thoroughly tested before being introduced.
- During this stage the building of the technical architecture, database and programs are executed.
- It is also the stage where the system is tested using the established test scripts and compare the expected outcomes to actual outcomes.

#### **5. Implementation:**

- The stage where system is in place and is used by the actual workforce.
- User guide manual and training are provided to users.

#### **6. Evaluation:**

- During this stage system need to be evaluated for any bug from time to time.

#### **Maintenance:**

- This is the stage where system needs to be enhanced or strengthened in order to meet the goals of the organization.

3.

#### **Write short notes on Personal Information System BTL2**

- Personal Information management is set of activities in which people perform in order to acquire, organize, maintain, retrieve and use personal information such as documents, web pages, email messages every day to accomplish the assigned tasks.
- Personal Information System (PIS) maintains the information about the employees in, department like personal, promotional, postings, qualifications, awards, incentives, leave etc. That assists an organization in many ways.
- There are various roles in the personal information system such as- employee, manager, customer, student and so on.
- Conceptually PIS is a collection information and methods that help the people to maintain the information of persons.
- This information system can be maintained offline. One can carry this information system in pen drive.

#### **Example -**

- Address book system
- Personal Notes
- Email notification
- Reminders and Alert system
- Lists
- Personal File collection system(document, music, photos)
- Instant messaging systems

#### **Need for Personal Information System:**

- This system saves times and efforts in locating the information.
- Information system is used for east retrieval of information.
- The information system organizes the entire information systematically.
- Using personal information system within an organization means better employee productivity and better team work in the near term.

#### **Functionality of Personal Information System:**

There are two modes of functionality of personal information system:

	<p><b>1. User panel:</b> The user panel is for entering the personal information such as profile details, qualification details, and employment details.</p> <p><b>2. Administrator panel:</b> The administrator panels maintain following activities like user settings, profile master, qualification master, and document upload master, email settings, printer settings. <b>Benefits of Personal Information System:</b></p> <ul style="list-style-type: none"> <li>Personal information system contains the data of all its users.</li> </ul> <p><b>5. Users can easily search and locate data with personal information management system</b></p> <ul style="list-style-type: none"> <li>Information stored in personal information system is transferrable to other locations and software programs.</li> </ul>
4.	<p><b>Design simple personal application that gives you reminders for each day. Identify the inputs to be taken, processing to be done, and the output to be produced . What multimedia components can be added to this application? BTL3</b></p> <p>The personal application for reminder is a simple and effective application that can be used in busy schedule for reminding the day to day activities.</p> <p>Features of this application:</p> <ul style="list-style-type: none"> <li>Users can set / update date / time of particular event.</li> <li>The history data can be cleared.</li> <li>Priority of task can be set or changed.</li> <li>One can feed to-do list to the application.</li> <li>The meeting schedule can be input to the application. The remaining application will display the schedule one hour prior to actual schedule.</li> <li>The birthdays, anniversaries or important dates can be reminded on particular dates by flashing images, messages and ringing alarm. Users can stop the alarm or press _remind me,, after sometime button.</li> <li>Email data via, name of person, email address, phone number and so on can be used by the application as input. This feature can be set if user permits to do so.</li> <li>The day / date / time can be set according to appropriate time zone of the country.</li> </ul> <p>The GUI for simple personal application that gives you reminders is as follows:</p> <ul style="list-style-type: none"> <li><b>Input :</b> Name of the person, birthdate, anniversary date, meeting time, purpose of meeting, allotted timing for meeting.</li> <li><b>Processing:</b> It involves making calculations, matching data against system date, matching person name, storing data for future use.</li> <li><b>Output:</b> Displaying reminding information on the device, displaying date, ringing alarm, flashing light.</li> </ul> <p><b>Multimedia Components:</b></p> <ul style="list-style-type: none"> <li><b>Text:</b> The text is used for typing the input to the system as well for displaying the name of the event, detailed information about some schedules, to-do list, name of the person and so on.</li> <li><b>Graphics:</b> The attractive graphics flashing as output on matching with date or time of particular event.</li> <li><b>Image:</b> The image / photo of the persons can be displayed on the app while reminding the birthdays and anniversaries.</li> <li><b>Audio:</b> Melodious songs or ringtone will be ringing for the reminding alarm.</li> <li><b>Animation:</b> Animated images or text can be displayed on the device for reminding app on particular event.</li> </ul>

**UNIT IV - MOBILE COMMUNICATION ESSENTIALS**

**Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS**

**PART - A**

1.	<b>What is Mobile Communications?BTL1</b> A wireless form of communication in which voice and data information is emitted, transmitted and received via microwaves. This type of communication allows individuals to converse with one another and/or transmit and receive data while moving from place to place. Some examples include: cellular and digital cordless telephones; pagers; telephone answering devices; air-to- ground telecommunications; and satellite-based communications
2.	<b>What are uses of cell phones?BTL2</b> <ul style="list-style-type: none"> <li>• Voice calling</li> <li>• Voicemail</li> <li>• E-mail</li> <li>• Messaging</li> <li>• Mobile content</li> <li>• Gaming</li> <li>• Personalize your phone –Play music</li> <li>• Take photos or videos</li> <li>• Download and view images</li> </ul>
3.	<b>What is a Cell?BTL2</b> The power of the radio signals transmitted by the BS decay as the signals travel away from it. A minimum amount of signal strength (let us say, $x$ dB) is needed in order to be detected by the MS or mobile sets which may be the hand-held personal units or those installed in the vehicles. The region over which the signal strength lies above this threshold value $x$ dB is known as the coverage area of a BS and it must be a circular region, considering the BS to be isotropic radiator. Such a circle, which gives this actual radio coverage, is called the foot print of a cell (in reality, it is amorphous).
4.	<b>How do mobile phone networks work?BTL2</b> A mobile phone is a portable telephone which receives or makes calls through a cell site (base station), or transmitting tower. Radio waves are used to transfer signals to and from the cell phone. Modern mobile phone networks use cells because radio frequencies are a limited, shared resource.
5	<b>What is the concept of frequency reuse?BTL2</b> A mobile network operator or MNO, also known as a wireless service provider, wireless carrier, cellular

	company, or mobile network carrier, is a provider of wireless communications services that owns or controls all the elements necessary to sell and deliver services to an end user including radio spectrum allocation, network infrastructure, backhaul infrastructure, billing, customer care, provisioning computer systems and marketing and repair organizations
6	<b>What is cellular network?BTL1</b> A cellular network or mobile network is a communication network where the last link is wireless. The network is distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. <input checked="" type="checkbox"/>
7.	<b>What is mobile network?BTL1</b> A cellular network or mobile network is a communication network where the last link is wireless. The network is distributed over land areas called cells, each served by at least one fixed-location transceiver, but more normally three cell sites or base stations.
8.	<b>List few cellular connections?BLT2</b> <ul style="list-style-type: none"> <li>• GSM</li> <li>• CDMA</li> <li>• LTE cellular data networks.</li> </ul>
9.	<b>What is mobile network operator?BTL2</b> A mobile network operator or MNO, also known as a wireless service provider, wireless carrier, cellular company, or mobile network carrier, is a provider of wireless communications services that owns or controls all the elements necessary to sell and deliver services to an end user including radio spectrum allocation, wireless network infrastructure, backhaul infrastructure, billing, customer care, provisioning computer systems and marketing and repair organizations
10.	<b>State handoff.BTL2</b> Handoff occurs when the mobile telephone network automatically transfers a call from radio channel to radio channel as a mobile crosses adjacent cell. Because dropping the call is unacceptable, the process of handoff was created
11.	<b>What are the cellular system components?BTL1</b> The cellular communications system consists of the following four major components that work together to provide mobile service to subscribers <ul style="list-style-type: none"> <li>• public switched telephone network(PSTN)</li> <li>• mobile telephone switching office(MTSO)</li> <li>• cell site with antenna system</li> <li>• mobile subscriber unit(MSU)</li> </ul>
12.	<b>What is location management?BTL1</b> An agent in the home network, called home agent, keeps track of the current location of the MS. The procedures to keep track of the users current location is referred to as location management.

13.	<p><b>State the difference between hard handoff and soft handoff.BTL2</b></p> <p>In hard handoff a mobile station communicates with one base station at a time. So, when it moves out from one base station to another, first it breaks connection with the existing one before establishing connection with a new base station. In soft handoff a mobile station can communicate with two base stations simultaneously.</p>
14.	<p><b>Define paging.BTL2</b></p> <p>The Mobile Identification Number (MIN) is then broadcast over all the forward control throughout the cellular system. It is known as paging.</p>
15.	<p><b>If you lose your cell phone you would deactivate your SIM. How is this achieved in the GSM architecture?BTL3</b></p> <p>Equipment identity register (EIR) is a database that keeps tracks of handsets on the network using the IMEI. There is only one EIR per network. It is composed of three lists; the white list, gray list, and the black list. The black list is a list of IMEIs that are to be denied service by the network for some reason. Reasons include the IMEI being listed as stolen or cloned or if the handset is malfunctioning or doesn't have the technical capabilities to operate on the network.</p>
16.	<p><b>What is meant by frequency reuse factor in a cellular network?BTL3</b></p> <p>The design process of selecting and allocating channel groups for all cellular base stations within a system is called frequency reuse. It uses radio frequencies over and over again throughout a market with minimal interference, to serve a large number of simultaneous conversations.</p>
17	<p><b>What are the obstacles in mobile communications?BTL2</b></p> <ul style="list-style-type: none"> <li>• Interference</li> <li>• Regulations and spectrum</li> <li>• Low Bandwidth</li> <li>• High delays, large delay variation</li> </ul>

	<ul style="list-style-type: none"> <li>• Lower security, simpler to attack</li> <li>• Shared Medium</li> <li>• Adhoc-networks</li> </ul>
18	<p><b>What are the Advantages of wireless LAN?BTL2</b></p> <ul style="list-style-type: none"> <li>• Flexibility</li> <li>• Planning</li> <li>• Design</li> <li>• Robustness</li> </ul>
19	<p><b>State the limitations of Mobile Computing.BTL2</b></p> <ul style="list-style-type: none"> <li>• Resource constraints.</li> <li>• Interface</li> <li>• Bandwidth</li> <li>• Dynamic changes in communication environment.</li> <li>• Network issues.</li> <li>• Interoperability issues.</li> </ul> <p><b>Security Constraints</b></p>

### Part \*B

1	<p><b>Write short on Cellular Networks: BTL2</b></p> <p>In terrestrial communication high power transmitters are used so that the area covered is large. For example Radio communication. In mobile or cellular communication, low power transmitters are used. So the area covered is less when compared with terrestrial Communication. So, even for a small location, more number of transmitters are required. The coverage area of a cellular transmitter is called as cell and it is hexagonal in shape.</p> <p><b>Cells:</b></p> <p><b>Frequency:</b> Frequency is the rate at which the signal repeats [in cycles per second].</p> <p><b>Spectrum:</b> The spectrum of a signal is the range of the frequency / frequencies that it contains.</p> <p><b>Frequency Reuse:</b> In a cellular system, each cell has a base transceiver. The transmission power is carefully controlled to allowed communication within the cell using a given frequency band by limiting the power at that frequency that escapes the cell into adjacent cells</p> <p><b>Reason for Hexagonal cell concept and not circular structure:</b></p> <ol style="list-style-type: none"> <li>By using hexagonal concept, we can divide the geographical area into less number of transmitters used is less. In reality, the shape is irregular polygon. If we use circular concept, the hidden areas are not covered properly.</li> <li>A cell phone carrier typically gets 832 radio frequencies to use in a city. Each cell</li> </ol>
---	--

phone uses two frequencies per call, a duplex channel. So there are typically 395 voice channels per carrier. (The other 42 frequencies are used for control channels).

- c. Therefore, each cell has about 56 voice channels available. In other words, in any cell, 56 people can be talking on their cell phone at one time. With digital transmission methods (2G), the number of available channels increases. For example, a TDMA-based digital system can carry three times as many calls as an analog system, so each cell has about 168 channels available.
- d. Frequency bands: Uplink: 890-915 MHz, Downlink: 935-960 MHz
- e. Frequency range: 50 MHz (25 MHz Up, 25 MHz Down)
- f. Carrier spacing: 200 kHz (but time shared between 8 subscribers)
- g. Duplex distance: 45 MHz(FDD)
- h. Communication between the base station and mobiles is defined by the standard common air interface(CAI)
  - 1. **Forward voice channel (FVC)** : Voice transmission from base station to mobile.
  - 2. **Reverse voice channel (RVC)** : Voice transmission from mobile to base station.
  - 3. **Forward control channels (FCC)**: Initiating mobile call from base station to mobile.
  - 4. **Reverse control channels (RCC)**: Initiating mobile call from mobile to base station.

#### **Channels (frequencies) used in one cell can be reused in another cell some distance**

- away, which allows communication by a large number stations using a limited number of radio frequencies.

#### **Channel Assignment**

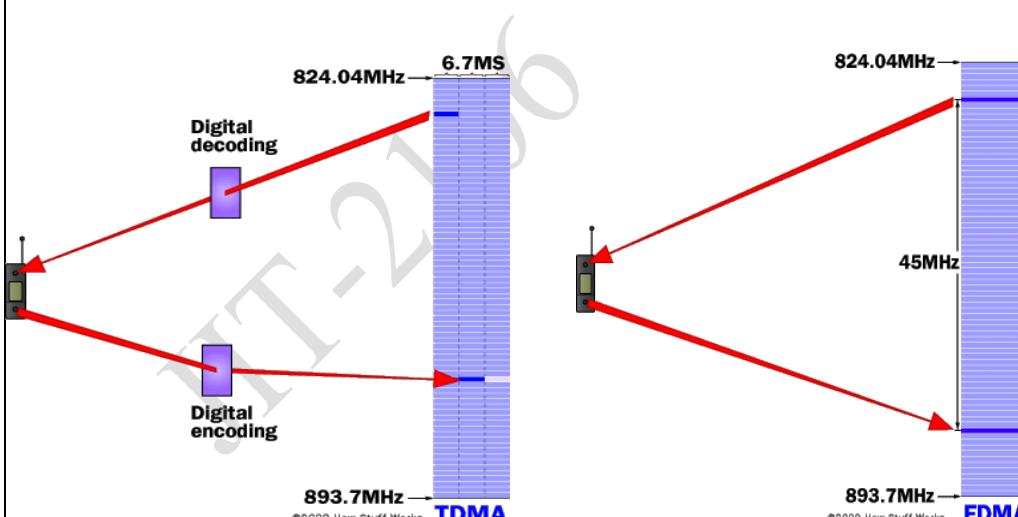
- **Fixed channel assignment (FCA)** : Channels are pre-allocated to the cells during planning phase.
- **Dynamic channel assignment (DCA)**: No pre-allocation. When a call comes/arrives at a cell then a channel not in use is selected.
- It requires the MSC to collect real time data, channel occupancy data, traffic distribution, radio signal strength, etc.,
- DCA schemes perform better under non-uniform and low traffic density. FCA performs well under high and uniform traffic.
- In FCA, the area is partitioned into a number of cells, and a number of channels are assigned to each cell according to some reuse pattern, depending on the desired signal

quality. Channel assignment schemes can be implemented in centralized or distributed fashion.

- In a centralized methods, the channels are assigned by a central controller, whereas in distributed methods a channel is selected either by the local base station of the call is initiated by the mobile. Channel assignment based on local assignment can be done for both FCA and DCA method.
- FCA method behave like a number of small groups of servers, while DCA provides a way of making these small group of servers behave like large servers.
- DCA method performs better under low traffic intensity. FCA method becomes superior at high offered traffic, especially in the case of uniform traffic.

#### **Channel Borrowing:**

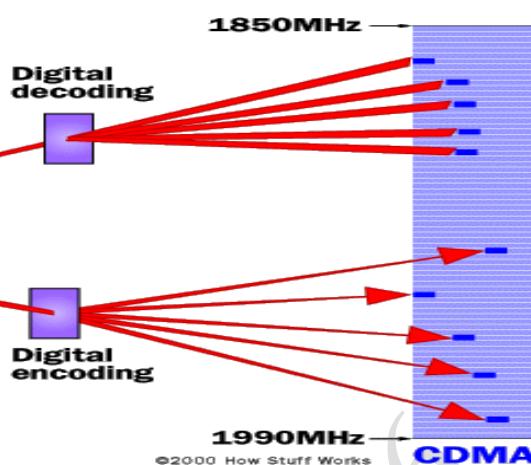
- It is a combination of fixed and dynamic channel assignment. A channel set is nominally assigned to each cell.

	<ul style="list-style-type: none"> <li>When all the channels in a cell are occupied, the cell borrows channels from other cells to accommodate the incoming new/handoff calls, as long as the borrowed channels do not interfere with the ones used by existing calls. Otherwise the call is blocked.</li> <li>The channel borrowing schemes are more flexible in the sense that by moving (borrowing) channels from less busy cells to more busy cells, a balanced performance throughout in the system can be achieved.</li> </ul>
2	<p><b>Write down the various Technologies Based On Sharing BTL2</b></p> <p>TDMA: Narrow band means "channels" in the traditional sense. Each conversation gets the radio for one-third of the time. This is possible because voice data that has been converted to digital information is compressed so that it takes up significantly less transmission space. Therefore, TDMA has three times the capacity of an analog system using the same number</p>  <p>TDMA diagram details: A vertical blue bar represents the 824.04MHz band. It is divided into 6.7MS time slots. Two red arrows point to a 'Digital decoding' block at the top and a 'Digital encoding' block at the bottom. The text 'TDMA' is written below the bar.</p> <p>FDMA diagram details: A vertical blue bar represents the 824.04MHz band. It is divided into 45MHz frequency channels. Two red arrows point to a 'Digital decoding' block at the top and a 'Digital encoding' block at the bottom. The text 'FDMA' is written below the bar.</p> <p>channels. TDMA systems operate in either the 800-MHz (IS-54) or 1900-MHz (IS-136) frequency bands. Time division multiple access (TDMA) is a channel access method (CAM) used to facilitate channel sharing without interference. TDMA allows multiple stations to share and use the same transmission channel by dividing signals into different time slots. Users transmit in rapid succession, and each one uses its own time slot. Thus, multiple stations (like mobiles) may share the same frequency channel but only use part of its capacity. TDMA is used in most 2G cellular systems, while 3G systems are based on CDMA</p> <p><b>FDMA:</b></p> <p>FDMA separates the spectrum into distinct voice channels by splitting it into uniform chunks of bandwidth. To better understand FDMA, think of radio stations: Each station sends its signal at a different frequency within the available band. FDMA is used mainly for analog transmission. While it is certainly capable of carrying digital information, FDMA is</p>

not considered to be an efficient method for digital transmission

#### **CDMA:**

CDMA takes an entirely different approach from TDMA. CDMA, after digitizing data, spreads it out over the entire available bandwidth. Multiple calls are overlaid on each other on the channel, with each assigned a unique sequence code. CDMA is a form of spread spectrum, which simply means that data is sent in small pieces over a number of the discrete frequencies available for use at any time in the specified range.



3 Explain in detail about the Cell Phone Network Technologies/ Architecture *BTL2*

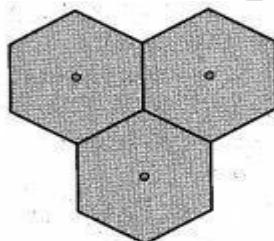


Fig. 4.5.2 (a) Imaginary cell

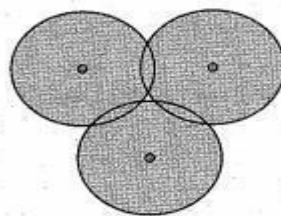


Fig. 4.5.2 (b) Ideal Cell

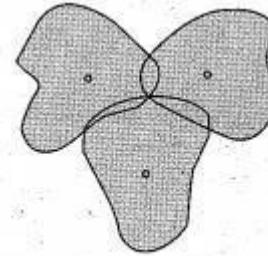


Fig. 4.5.2 (c) Real world cell

- Handoff measurement are as follows:

1. In first generation analog circular systems, signal strength measurements are made by the base station and supervised by the MSC.
2. In second generation systems (TDMA), handoff decisions are mobile assisted, called mobile assisted, called mobile assisted handoff (MAHO).

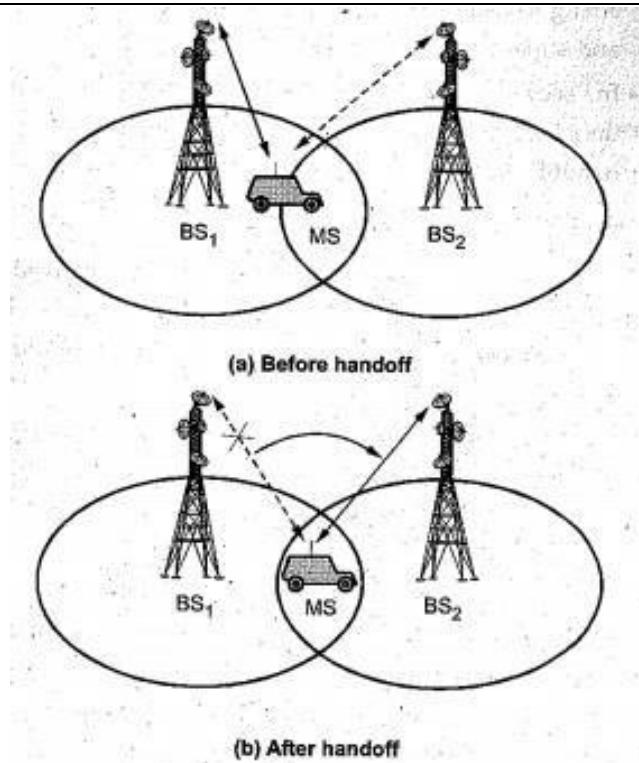


Fig. 4.5.3 Handoff

### Handoff Mechanism

- Base station continuously measure received signal strength indication.
- Based on this measurements decide the Handoff request.
- Once Handoff request is identified, asks adjacent cells to measure the RSSI on that mobile and send the measurements.
- Identifies the candidate cell for Handoff
- Start Handoff
- Handoffs are of two types: Hard and soft handoffs
- The hard handoff can be further divided into two different types: Intra and intercell handoffs
- The soft handoff can also be divided into two different types : multiway soft handoffs and softer handoffs.

### Frequency Reuse:

- Cellular technology enables mobile communication because they use of a complex two-way radio system between the mobile unit and the wireless network.
- It uses radio frequencies (radio channels) over and over again throughout a market with minimal interference, to serve a large number of simultaneous conversations. This concept is the central tenet to cellular design and is called frequency reuse.
- Most frequency reuse plans are produced in groups of seven cells. Same frequency is reused by each sector.
- The number of cells per cluster defines the reuse pattern and this is a function of the cellular geometry. Cell sizes vary from some 100m upto 35 km depending on user density, geography, transceiver power etc. The hexagonal shape of cells is idealized.
- By limiting the coverage area to within the boundary of the cell, the channel groups may be reused to cover different cells.

- Consider a cellular system which has a total of  $S$  duplex channels. Each cell is allocated a group of  $k$  channels,  $k < S$ . The  $S$  channels are divided among  $N$  cells.
- The total number of available radio channels  $S = kN$
- The  $N$  cells which use the complete set of channels is called cluster. The cluster can be repeated  $M$  times within the system. The total number of channels,  $C$  is used as a measure of capacity  $C = MkN = MS$ .
- The capacity is directly proportional to the number of replication  $M$ . The cluster size,  $N$ , is typically equal to 4, 7 or 12. Small  $N$  is desirable to maximize capacity.
- The frequency reuse factor is given by  $1/N$ .

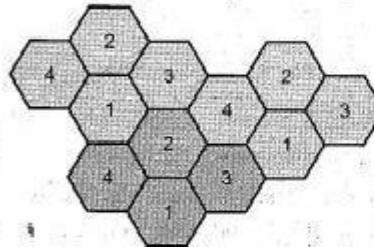


Fig. 4.5.6 (a) Frequency reuse factor =4

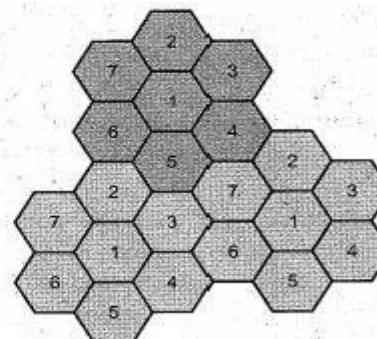
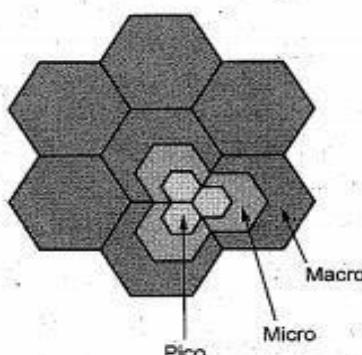


Fig. 4.5.6 (b) Frequency reuse factor =7

### Cell Splitting

- Cell splitting increases the capacity of cellular system since it increases the number of times the channel are reused.
- Cell splitting – defining new cells which have smaller radius than original cells by installing these smaller cells. Capacity increases due to additional number of channels per unit area.
- Cell splitting is process of subdividing a congested cell into smaller cells each with its own base station.
- When traffic density starts to build up and frequency channels in each cell cannot provide enough mobile cells the original cell can be split into smaller cells.
- The original congested bigger cell is called macrocell and the smaller cells are called microcells.
- Capacity of cellular network can be increased by creating micro cells within the original cells which are having smaller radius than macro-cells, therefore the capacity of a system increases because more channels per unit area are now available in a network.
- Splitting of cells causes an unbalanced situation in power and frequency reuse distance. Hence it becomes necessary to split small cells in the neighboring cells.

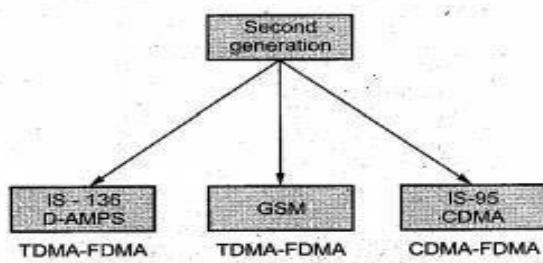
Thus cell splitting affects the neighboring cells.

**Fig. 4.5.7 Cell splitting****Part - C****1 Write Down The Various Generation Of Cellular Networks BTL2****First generation :**

- The first generation (1G) mobile phone networks uses analog signal to transmit the voice calls only between the two transmitters. The main technology of this first generation mobile system was FMDA / FDD and analog FM.
- One example is advanced mobile phone system (AMPS ) used in North America . AMPS is an analog cellular phone system.
- It uses 800 MHz ISM band and two separate analog channels; forward and reverse analog channel s. The band between 82 4 to 849 MHz is used for reverse communication from MS To BS. The band between 869 to 894 MHz is used for forward communication from BS to MS. Each band is divided into 83230 khz channels.

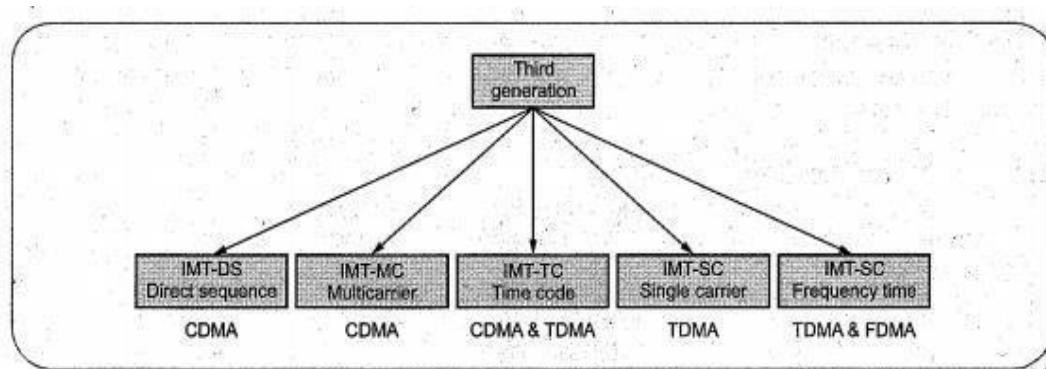
**Second generation :**

- Second generation (2G) mobile network is the next stage in the development of wireless technology to overcome the limitation 1G by primarily focusing on transmission of voice and data with digital signal.
- Many digital cellular system rely on Frequency shift keying (FSK) to send data back and forth over AMPS. FSK uses two frequency ,one for 1s and other for 0s.Digital cell phones have contain a lot of processing power.
- 2.5 G network's also brought into the market some popular application your few of which are : Wireless Application Protocol (WAP), General Packet Radio Service (GPRS ),High Speed Circuit Switched Data( HSCSD ) ,Enhanced Data Rates for GSM Evolution (EDGE)

**Fig. 4.4.1**

### **Third Generation:**

- Third Generation (3G) was arrived because of low speed and incompatible technologies used on previous generations.
- It is based on the International Telecommunication Union (ITU) family of standards under the International Mobile Telecommunication -2000 (IMT2000).
- The main features of (3G) is that it allows Higher data transmission rates and increased capacity for the traditional voice call and high speed data application such as Global roaming, Internet mobile, video conferencing , video calls and 3D gaming.
- 3G networks are wide area cellular Telephone Network which evolved to incorporate high- speed internet access and video telephony . Goal of the 3G technologies are mentioned below:
  - Allow both digital data and voice communication.
  - To facilitate Universal personal communication
  - Listen music ,watch movie ,access internet video conferencing, etc.



### **IMT -2000 defines a set of Technical requirements :**

- Requires high data rates :144 KBPS in all environment and 2Mbps in low- mobility and indoor environments.
- Support symmetrical and asymmetrical data transmission.
- It also support circuit -switched and packet switched based service.

### **Fourth Generation :**

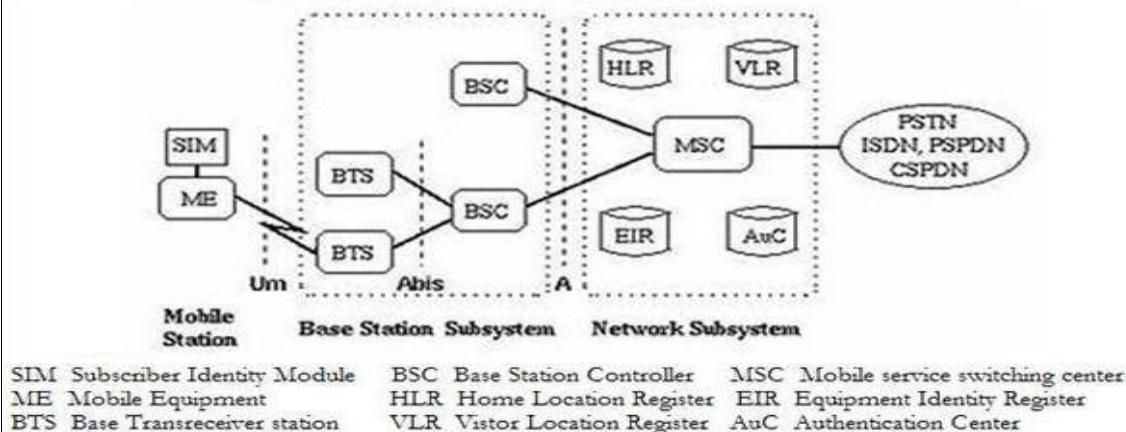
- 4G is called as MAGIC because the user can use the mobile multimedia at anytime anywhere with Global mobility support on integrated wireless solution and customized personal service at high speed data rates than previous generations.
- 4G will be a fully IP -based integrated system .4G will be capable of providing between 100 Mbps and 1 Gbit/s speed both indoor and outdoor with premium quality and high security.

### **Fifth Generation:**

Fifth generation (5G) is a packet switched wireless mobile communication system with extensive area coverage and high throughput. Hence, it is called as real world wireless or wireless world-wide web (WWW).

2

## Explain in detail about the working principles of GSM Architecture BTL2



### GSM Channels

- Physical channel corresponds to a time slot on a frequency carrier. There are 8 physical channels per carrier in GSM. Physical channel can be used to transmit speech, data or signalling information.
- The channel from the base station to the mobile unit is known as the downlink or forward channel. The channel from the mobile unit to the base station is known as the uplink or reverse channel.

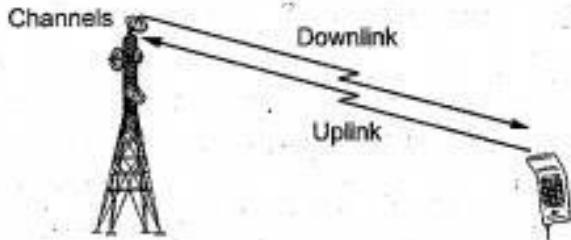
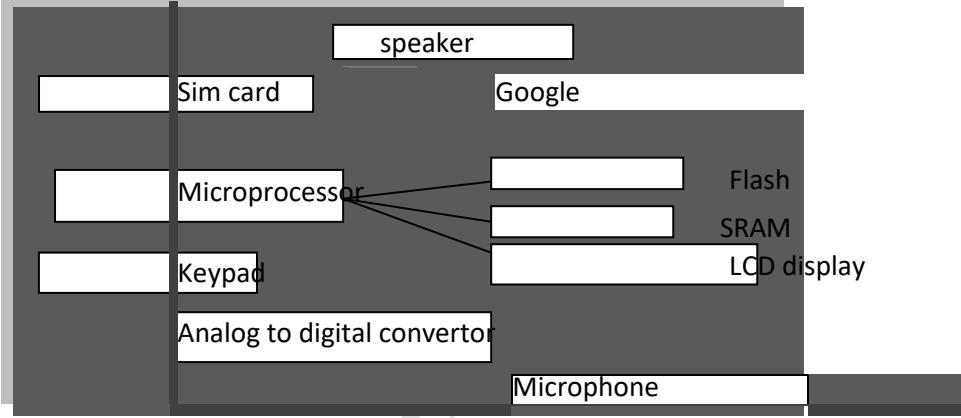


Fig. 4.4.6 GSM channel

- Physical channel:** Each timeslot on a carrier is referred to as a physical channel.
- Logical channel:** Variety of information is transmitted between the MS and BTS. GSM logical channels consist of two types : Control channels and traffic channels.
- Control channels:** Control channels are subdivided into three types: Broadcast Control Channel, Common Control Channel and Dedicated Control Channel.
- Channels used for communication between the MS and BSS when a call is in progress.
- Control channels used by idle mode mobiles to exchange signaling information, required changing to dedicated mode.
- Mobiles in dedicated mode monitor the surrounding Base Stations for handover and other information. Control Channels include:
  - 1) Broadcast Control Channel (BCCH) serves for BS identification, broadcasts and frequency allocations.
  - 2) Frequency Control Channel (FCCH) and Synchronization Channel (SCH)- used for synchronization, and physical layer definition ( time slots, burst time)
  - 3) Random Access Channel (RACH) used by mobile to request access to the network.

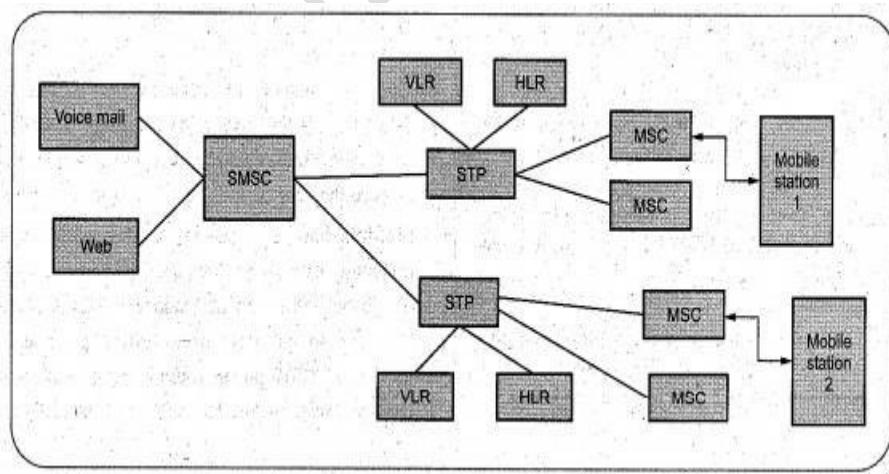
	<p>4) Paging Channel (PCH) used for locating the mobile user. Access Grant Channel (AGCH) used to obtain a dedicated channel. (Following the request of RACH)</p>
3	<p><b>Describe in details various function involved in Digital Cell Phone Components BTL2</b></p> <ul style="list-style-type: none"> <li>Cell phone and said is composed of two components: <b>Radio Frequency (RF)</b> and <b>baseband</b>. RF is the mode of communication for wireless Technologies of all kinds including cordless phones, Radar, ham radio, GPS and radio and television broadcast. RF waves are electromagnetic waves which propagate at the speed of light.</li> <li><b>Base band:</b> In telecommunications, it is the frequency range occupied by a message signal prior to modulation it can be considered as a synonym to low -pass.</li> </ul>  <p>The diagram illustrates the internal architecture of a mobile phone. It features a central vertical column of components connected to a horizontal bus bar. At the top is a speaker. Below it is a Sim card slot. Further down is a Microprocessor, which is connected to a Keypad and an Analog to digital converter. To the right of the Microprocessor, there is a Google logo, followed by Flash memory, SRAM, and an LCD display. A Microphone is located at the bottom, connected to the bus bar.</p> <ul style="list-style-type: none"> <li>Mobile phone contains SMD components ,microprocessor ,Flash Memory etc., In addition to the circuit board, mobile phone also as Antenna ,Liquid crystal display( LCD ), keyboard , microphone , speaker and battery.</li> <li>Mobile devices contain nonvolatile and volatile memory volatile memory (i.e, RAM) is used for dynamic storage and its content or lost when power is drained from the mobile device. Nonvolatile memory is persistent as its contents are not affected by laws of power or overwriting data upon reboot. Mobile devices typically contain one or two different type of non-volatile Flash Memory. These types are NAND and NOR. NOR flash as faster read times, slower write times than NAND and is nearly immune to corruption and bad blocks while allowing random access to any memory location.</li> <li>NAND Flash Memory contains PIM data, graphics, and audio, video and other user files. NAND flash memory may leave multiple copies of transaction based files due to wear leveling algorithms and garbage collection routines. Since NAND Flash Memory cells can be re-used for only a limited amount of time before they become unreliable ,wear leveling algorithms are used to increase the lifespan of flash memory storage ,by arranging data so that erasures and rewrite are distributed evenly across the SSD.</li> <li>When your mobile phone transmits audio it applies an oscillating electric current to the</li> </ul>

mobile phone antenna. The mobile phone antenna then emits corresponding electromagnetic waves, which are also known as radio waves. To receive calls the mobile phone antenna intercepts an electromagnetic wave of a particular frequency.

- Mobile phone antennas transmit signals to radio Towers and receive signals back simultaneously. In a cellular network the towers are distributed over portion of land called cells .Each cell of land contains at least one Radio tower. Each cell is also assigned a number of frequencies which correspond to Radio base stations. Other cells can use the same frequencies as long as they are not adjacent. Mobile phones uses following components:
- **Digital signal processor:** It is generally rated as having 40 MIPS( millions of instructions per second ) to conduct for calculation of signal manipulation at high speed. This chip deals with the both compression and decompression of the signal.
- **Microprocessor:** It performs command and control signaling with the base station, and coordinates the rest of functions on the board.
- **Flash memory and ROM chips** of the mobile phone acts as a storage location for the phone .The power and radio frequency section of the phone, phone recharging and power management act are controlled by this chip.
- **SIM card** (Subscriber Identification module (SIM)) is a type of Smart Card used in mobile phone. The SIM is a detachable Smart Card containing the user's subscription information and phone book.
- Mobile phones have special code associated with them. these include:
- **Electronic serial number (ESN):** It is a unique 32 bit number programmed in the phone.
- **Mobile identification number (MIN):** It is a 10 digit number derived from the phone's number.
- **System Identification Code ( SID) :** It is unique 5 digit number that is assigned to each carrier by the FCC.

ESN is a permanent part of the phone while MIN and SID codes are programmed in the phone when your service plan is selected and activated

#### SHORT MESSAGE SERVICE



The mobile station is powered on and registered with the network.

**Step 2:** The MS transfers the SMS to the MSC.

**Step 3:** The MSC interrogates the VLR to verify that the message transfer does not violate the supplementary services invoked or the restrictions imposed.

**Step 4:** The MSC send the short message to the SMSC using the forward short message operation.

- Step 5:** The SMSC delivers the short message to SME (acknowledgement is optional).
- Step 6:** The short message is submitted from the ESME(External Short Message Entity) to the SMSC.
- Step 7:** After completing its internal processing, the SMSC interrogates the HLR.
- Step 8:** The SMSC send the short message to the MSC using forward short message operation.
- Step 9:** The MSC retrieves the subscriber information from the VLR. This operation may include an authentication procedure.
- Step 10:** The MSC transfers the short message to the mobile station.
- Step 11:** The MSC returns to the SMSC the outcome of the forward short message operation.
- Step 12:** If requested by the ESME, the SMSC returns a status report indicating delivery of the short message.
- Step 13:** The SMSC acknowledges to the MSC the successful outcome of the forward short message operation.

## 1. VOICE CALLS

Cell Phones are used to

- Store contact information
- Make task or to-do lists
- Send or receive e-mail
- Get information (news, entertainment, stock quotes) from the Internet
- Play games
- Watch TV
- Send text messages
- Take photos and videos

## 2. MULTI -BAND AND MULTI-MODE PHONES

- A band is a portion of the RF spectrum with the distinct propagation characteristics and/or requiring radios with distinct technological characteristic.
- A portion of the RF spectrum allocated for a specific purpose. For example: ISM (multiple), cellular, PCS, Television (multiple). A radio which is a 'multiband' works in multiple bands with or no modification.
- Mode is method of communication. The PCS defines bands and constrains the allowed mode in each band. Radios traditionally use a single mode because they are typically used for just one thing.
- Multiple bands: A phone that has multiple band capability can switch frequencies. For example, a dual band TDMA phone could use TDMA services in either an 800-MHz or a 1900MHz system. A quad band GSM phone could use GSM service in the 850-MHz, 900- MHz, 1800-MHz or 1900-MHz band.

### Why Multiband /Multimode Radio (MMR)?

- **Military:** Interoperability a perpetual problem, becoming particularly acute with the advent of rapid joint service ops in the 1980s. Primary instigators for the software – defined radio (SDR), but the underlying motivation is to have multiband/multimode capabilities.
- **Public safety:** Analogous to military application, except interest in interoperable radio is much more recent and cost is much bigger issue.
- –All-in-ones –and personal digital assistants (PDAs).
- Dynamic spectrum and new paradigms for spectrum management. Multiband/multimode radio is enabling technology for these things, however, white space seek/detect is a new application.

--	--

JIT-2106

**UNIT V APPLICATION ESSENTIALS**

**Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications**

**PART - A**

1.	<p><b>What is database?BTL1</b></p> <p>A database is a collection of information that is organized so that it can be easily accessed, managed and updated. Data is organized into rows, columns and tables, and it is indexed to make it easier to find relevant information. Data gets updated, expanded and deleted as new information is added. Databases process workloads to create and update themselves, querying the data they contain and running applications against it.</p>
2.	<p><b>What are database application?BTL2</b></p> <p>A database application is a computer program whose primary purpose is entering and retrieving information from a computerized database. Early examples of database applications were accounting systems and airline reservations systems.</p>
3.	<p><b>Define multimedia.BTL2</b></p> <p>Computer-based techniques of text, images, audio, video, graphics, animation, and any other medium where every type of information can be represented, processed, stored, transmitted, produced and presented digitally.</p>
4.	<p><b>State the characteristics of multimedia.BTL2</b></p> <p>Multimedia systems must be computer controlled</p> <ul style="list-style-type: none"> <li>• Multimedia systems are integrated.</li> <li>• The information they handle must be represented digitally.</li> </ul> <p>The interface to the final presentation of media is usually interactive</p>
5.	<p><b>What is interactive multimedia?BTL1</b></p> <p>Interactive multimedia, any computer-delivered electronic system that allows the user to control, combine, and manipulate different types of media, such as text, sound, video, computer graphics, and animation.</p>
6.	<p><b>What is personal information system?BTL1</b></p> <p>The Personnel Information system is a Computer based system for maintenance of the Service Registers of individuals in an organization. The details pertaining to personnel, postings, qualifications, departmental tests passed, training</p>

	attended, family details etc are stored in this system.
7.	<p><b>Define information retrieval.BTL2</b></p> <p>Information Retrieval is finding material of an unstructured nature that satisfies an information need from within large collections.</p>
8.	<p><b>Explain difference between data and information.BTL3</b></p> <p>Data: It is the raw fact. For its retrieval it needs to be fully mentioned. If the file name or the document name is not known or is case sensitive, there are chances for the system to fail and do not retrieve any document.</p> <p>Information: Information is processed data. For its retrieval partial information is enough for its evaluation. Hence, the system never fails. Examples of information are a piece of paper on a table, a book in the shelf, a bubble-sort algorithm.</p>
9.	<p><b>List and explain components of IR block diagramBTL1</b></p> <ul style="list-style-type: none"> <li>• Input – Store Only a representation of the document</li> <li>• A document representative – Could be list of extracted words considered to be significant.</li> <li>• Processor – Involve in performance of actual retrieval function</li> <li>• Feedback –Improve</li> <li>• Output – A set document numbers.</li> </ul>
10.	<p><b>What do you mean information retrieval models?BTL2</b></p> <p>A retrieval model can be a description of either the computational process or the human process of retrieval: The process of choosing documents for retrieval; the process by which information needs are first articulated and then refined</p>
11.	<p><b>What is meant by evolution in Social Networks?BTL1</b></p> <p>Visual representation of social networks is important to understand the network data and convey the result of the analysis. Signed graphs can be used to illustrate good and bad relationships between human's location-based interaction analysis, social sharing and filtering, recommender systems development, and link prediction and entity resolution.</p>

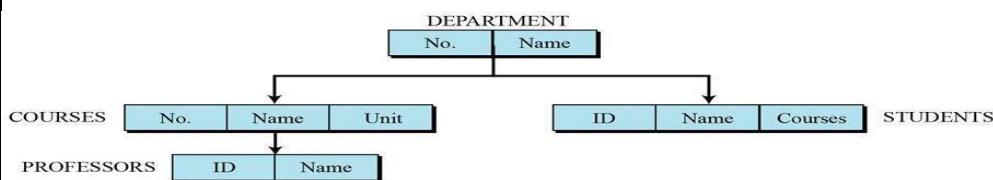
12.	<p><b>Define data and information. Data.BTL2</b></p> <p>Raw facts such as an employee's name and number of hours worked in a week, inventory part numbers or sales orders.</p> <p><b>Information:</b></p> <p>A collection of facts organized in such a way that they have additional value beyond the value of the facts themselves.</p>
13	<p><b>What is the role of information system in today's competitive business environment?BTL2</b></p> <ul style="list-style-type: none"> <li>• Data Processing</li> <li>• Management Reporting</li> <li>• Decision support</li> <li>• Strategic and End User Support</li> <li>• Global Internet working</li> </ul>
14	<p><b>What is the role of information system in an organization?BTL2</b></p> <ul style="list-style-type: none"> <li>• Focuses on competitive priorities</li> <li>• Support business processes and operations</li> <li>• Provide access to information</li> <li>• Enhance communication</li> <li>• Provide decision assistance</li> </ul> <p>Supports strategies for competitive advantage</p>
15	<p><b>What is interactive application?BTL1</b></p> <p>An interactive application is a collection of objects intended for performing certain task when user triggers the command. Typical examples of interactive web applications are online course registration system, online shopping system and so on.</p>
16	<p><b>List the steps involved in atypical application development life cycle.BTL3</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Understand data items and the data dictionary</li> <li><input type="checkbox"/> Understand the table design</li> <li><input type="checkbox"/> Understand business view design</li> </ul> <p><b>Understand report design</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Understand data structure design</li> <li><input type="checkbox"/> Understand system function</li> </ul>

17	<p><b>What are the advantages of DBMS?BTL2</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Reduced data redundancy</li> <li><input type="checkbox"/> Data consistency</li> <li><input type="checkbox"/> Sharing of data</li> <li><input type="checkbox"/> Data integrity</li> <li><input type="checkbox"/> Improved security</li> <li><input type="checkbox"/> Improved security</li> </ul>
18	<p><b>What is data model in database?BTL1</b></p> <p><b>The data model in Database Applications describes the logical structure of database, relationship between the database stored in database and various constraints on data</b></p>
19	<p><b>What is Personal Information System?BTL1</b></p> <p>Personal information management is a set of activities in which people perform in order to acquire, organizing, maintain, retrieve and use personal information such as documents, web page, email messages every day to accomplish the assigned task.</p>
20	<p><b>What are the advantages of using a DBMS?BTL2</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Controlling redundancy</li> <li><input type="checkbox"/> Restricting unauthorized access</li> <li><input type="checkbox"/> Providing multiple user interfaces</li> <li><input type="checkbox"/> Providing backup and recovery</li> <li><input type="checkbox"/> Enforcing integrity constraints</li> </ul>

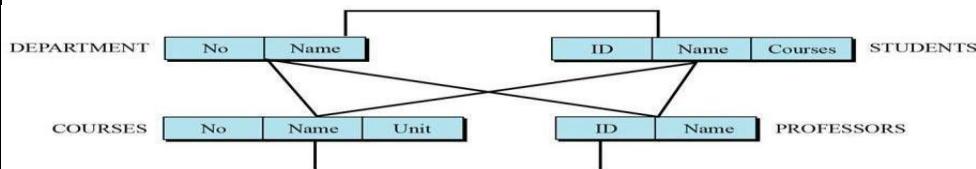
### Part \*B

1	<p><b>Write the Steps for creating Simple Interactive Web Applications BTL2</b></p> <ol style="list-style-type: none"> <li><b>1. Understanding Data Items and the Data dictionary</b></li> <li><b>2. Understanding the Table Design</b></li> <li><b>3. Understanding Business View Design</b></li> <li><b>4. Understanding Form Design</b></li> <li><b>5. Understanding Report Design</b></li> <li><b>6. Understanding Data Structure Design</b></li> <li><b>7. Understanding Event Rules Design:</b></li> </ol> <p>Perform mathematical calculation.</p> <p>Pass data from one field in the form to another field in another form.</p>
---	---

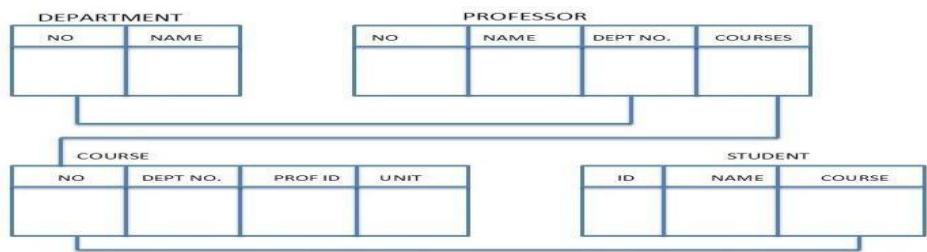
	<p>Interconnect two forms.</p> <p>Hide and display the controls using system functions. Assign the value or an expression to particular field.</p> <p>Creation of variables or programmer defined field at run time. Process table input and output, validate data and retrieve record.</p> <p><b>8. Understanding system Functions:</b></p>
2	<p><b>Write short notes on Simple Database Applications BTL2</b></p> <p><b>Definition:</b> Database is an organized collection of data. A database management system (DBMS) is a computer software application that interacts with the user, other applications and the database itself to capture and analyze data.</p> <p><b>Examples:</b> MS-Access, Oracle, MySQL</p> <p><b>Characteristics of Database Applications</b></p> <ul style="list-style-type: none"> <li>1. Consistency: DBMS provide greater consistency to the forms of data storage.</li> <li>2. Support for Query Language – To retrieve and manipulate the data efficiently</li> <li>3. Multiuser Environment: Simultaneous access of the database without creating conflicts.</li> <li>4. Less Data Redundancy:</li> <li>5. Relationship among Data</li> <li>6. Security</li> </ul> <p><b>Advantages of DBMS</b></p> <ul style="list-style-type: none"> <li>1. Reduced Data redundancy</li> <li>2. Data consistency</li> <li>3. Sharing of data</li> <li>4. Centralized database</li> <li>5. Data Integrity</li> <li>6. Improved Security</li> <li>7. Use of Standards</li> <li>8. Backup and Recovery</li> <li>9. Increased productivity</li> <li>10. Increased Concurrency</li> <li>11. Improved Maintenance</li> </ul> <p><b>Disadvantages of DBMS:</b></p> <ul style="list-style-type: none"> <li>• Complexity – Difficult to implement</li> <li>• Size - Large storage spaceCost - The multiuser database management system is very expensive.</li> </ul> <p><b>Data Models</b></p> <p>They describe the logical structure of a database, relationship between the database stored in database and various constraints on data.</p> <p><b>Importance of Data Model</b></p> <ul style="list-style-type: none"> <li>1. End users have different view for data.</li> <li>2. Data model organizes data for different users.</li> </ul> <p><b>Types of Data Model:</b></p> <p><b>2. Hierarchical Model</b></p>



### 1. Network Model:



### Relational Model



3. **Describe about E-R Model BTL2  
Components of ERD Entity**

**Relationship**

**Attribute**

**Notations used in ER Diagram Entity**

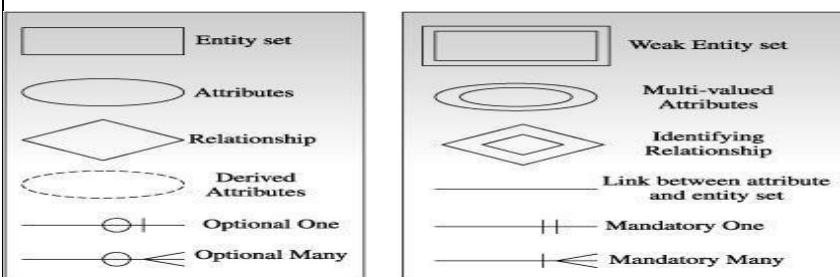
**Weak Entity**

**Attribute Derived**

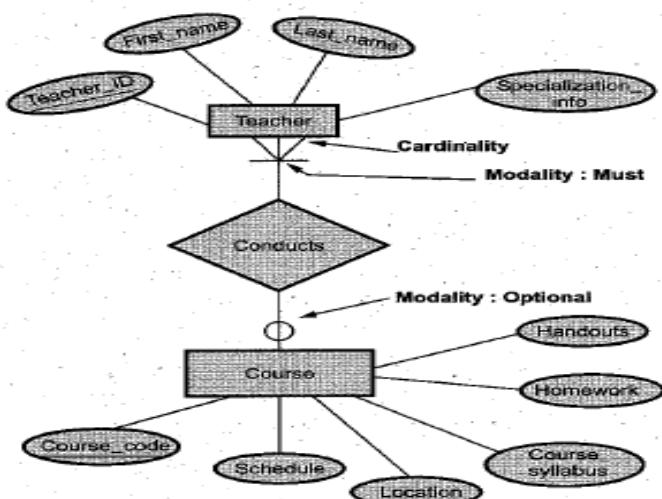
**attribute Key attributes**

**Multivalued attribute**

**Relationship**



Example: Draw an ER diagram for the relationship of teacher, and courses. Also specify the association, cardinality and modality

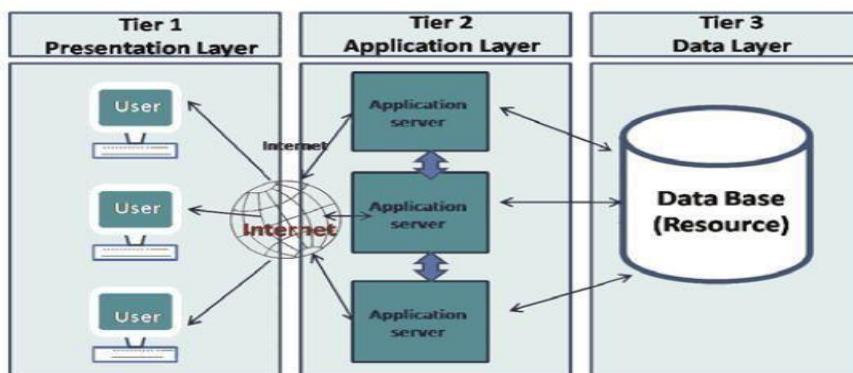


#### 4. Explain in details about the Architecture of Database Systems: BTL2

The database system architecture represents the structure and layout of the data stored in it. The architecture of database system can be from single tier to multitier. The multi-tiered system divides the whole system into multiple modules. Each of these individual modules can be independently altered or modified.

##### Database Tier:

This is the layer at which the actual database resides. In this layer, all the tables, their mappings and the actual data present. When you save your details from the front end, it will be inserted into the respective tables in the database layer, by using the programs in the application layer. When the



## Data Independence



## Data Dictionary:

**Concept:** Data dictionary contains information about database itself. The data dictionary thus contains the **metadata** i.e. data about data. Following types of information is stored in data dictionary.

- Definition of database objects such as tables, views, constraints, clusters, procedures, functions, triggers
- Column name
- Data type information
- Amount of space required to store the data object
- Default field values
- Access rights
- Database usernames – Schema information
- Last updated or accessed information

1. Primary Key
2. Candidate Key
3. Foreign Key
4. Composite Key

5

## Explain in details about the MULTIMEDIA APPLICATIONS BTL2

The word multimedia means more than one media for conveying information. The multimedia can be defined as:

**Definition:** Computer- based techniques of text, images, audio, video, graphics, animation , and any other medium where every type of information can be represented, processed, stored, transmitted, produced and presented digitally.

### Examples:

Some of the important programs are listed below in some categories. They are:

- Maya, Flash, Blender, comes mainly under graphics category.
- Interactivity category basically includes MySQL, AJAX, Flash and Flex and PHP.
- Audio category is of sound slides, Pro-tools, Adobe Auditions and more.
- Similarly programs in video category are Canopus Edius, i Movie, Flash Video Encoder, Final Cut Pro.
- Text programs are like Word press, InDesign, and Dream Weaver.

### Components of Multimedia:

#### Uses of Multimedia:

1. Education:
2. Training:
3. Business:

#### 4. Games and Entertainment:

.

#### Part \*C

##### 1. Describe in details about the Information System BTL2

**Definition:** An Information System (IS) is a set of interrelated components that collect, manipulate, store and disseminate data and information and provide a feedback mechanism to meet an objective.

##### Examples:

- 1. Supply Chain Management:
- 2. Customer Relationship Management:
- 3. Geographic Positioning System (GPS):
- 4. Enterprise Resource Planning (ERP):



##### Characteristics of Information System:

- **Accessibility** : Information present in the information system should be easily accessible by authorized users.
- **Accurate**: The information must be accurate and error free.
- **Complete**: Information present in the information system must be complete so that it will satisfy all the queries of its users.
- **Relevant**: The relevant information is important for the decision maker.
- **Reliable**: This is very important characteristics of the information system. The reliable information is trusted by its users. The reliability of information depends upon the sources of data collection for the information systems.
- **Secure**: The information systems must be secure and prevent any unauthorized access to it.
- **Simple**: The information system must be very simple to handle and not very complex. It should not present the information system with too many details whereby the decision maker is unable to determine what is really important.

**Timely:** The information in the information system must be delivered in timely manner

- whenever it is required.
- **Economical**: Information must be economical to produce.
- **Verifiable**: The information must be verifiable, that means one can check it to make it sure that information available in the information system is correct.

##### Components of Information Systems:

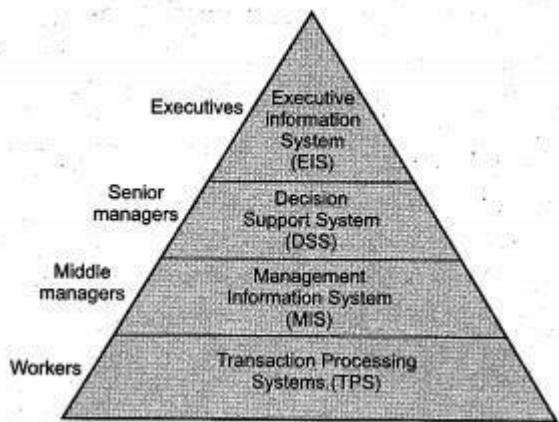
**Hardware:** Computer-based information systems use computer hardware, such as processors, monitors, keyboard and printers.

**Software:** These are the programs used to organize process and analyze data.

**Databases:** Information system work with data, organized into tables and files.

**Network:** Different elements need to be connected to each other, especially if menu different people in an organization use the same information system.

**Procedures:** These describe how specific data are processed and analyzed in order to get the answers for which the information system is designed.



## 2 Do the Design and Development of Information System using Financial Analysis system BTL3

### 1. Feasibility study:

- The aim of a feasibility study is to see whether it is possible to develop a system at a reasonable cost. At the end of the feasibility study a decision is taken whether to proceed or not.
- A feasibility study contains the general requirements of the proposed systems. It may be that development of a new system is not needed instead an update of the existing is enough.

### 2. Requirement Analysis:

- This is very important part in the development of an Information System and involves looking at an organization or system and finding out how information is being handled at the moment.
- The stage where users and IT specialists work together to collect and comprehend the business requirements. Based on requirements, both will work on the design and discuss the tasks to be done.
- The requirement analysis document is prepared at the end of this stage.

### 3. Design:

- At, this stage the systems blueprint is created.
- The technical architecture is designed which includes telecommunications, hardware and software suited for the system.
- The design process include: Outputs, Inputs, File Design, Hardware, Software
- The system design should be done for : user interface, data design, process design

### 4. Development and Testing:

- Any new system needs to be thoroughly tested before being introduced.
- During this stage the building of the technical architecture, database and programs are executed.

	<ul style="list-style-type: none"> <li>It is also the stage where the system is tested using the established test scripts and compare the expected outcomes to actual outcomes.</li> </ul> <p><b>5. Implementation:</b></p> <ul style="list-style-type: none"> <li>The stage where system is in place and is used by the actual workforce.</li> <li>User guide manual and training are provided to users.</li> </ul> <p><b>6. Evaluation:</b></p> <ul style="list-style-type: none"> <li>During this stage system need to be evaluated for any bug from time to time.</li> </ul> <p><b>Maintenance:</b></p> <ul style="list-style-type: none"> <li>This is the stage where system needs to be enhanced or strengthened in order to meet the goals of the organization.</li> </ul>
3.	<p><b>Write short notes on Personal Information System BTL2</b></p> <ul style="list-style-type: none"> <li>Personal Information management is set of activities in which people perform in order to acquire, organize, maintain, retrieve and use personal information such as documents, web pages, email messages every day to accomplish the assigned tasks.</li> <li>Personal Information System (PIS) maintains the information about the employees in, department like personal, promotional, postings, qualifications, awards, incentives, leave etc. That assists an organization in many ways.</li> <li>There are various roles in the personal information system such as- employee, manager, customer, student and so on.</li> <li>Conceptually PIS is a collection information and methods that help the people to maintain the information of persons.</li> <li>This information system can be maintained offline. One can carry this information system in pen drive.</li> </ul> <p><b>Example -</b></p> <ul style="list-style-type: none"> <li>Address book system</li> <li>Personal Notes</li> <li>Email notification</li> <li>Reminders and Alert system</li> <li>Lists</li> <li>Personal File collection system(document, music, photos)</li> <li>Instant messaging systems</li> </ul> <p><b>Need for Personal Information System:</b></p> <ul style="list-style-type: none"> <li>This system saves times and efforts in locating the information.</li> <li>Information system is used for east retrieval of information.</li> <li>The information system organizes the entire information systematically.</li> <li>Using personal information system within an organization means better employee productivity and better team work in the near term.</li> </ul> <p><b>Functionality of Personal Information System:</b></p> <p>There are two modes of functionality of personal information system:</p> <ol style="list-style-type: none"> <li><b>User panel:</b> The user panel is for entering the personal information such as profile details, qualification details, and employment details.</li> <li><b>Administrator panel:</b> The administrator panels maintain following activities like user settings, profile master, qualification master, and document upload master, email settings, printer settings.</li> </ol> <p><b>Benefits of Personal Information System:</b></p> <ul style="list-style-type: none"> <li>Personal information system contains the data of all its users.</li> </ul>

**5. Users can easily search and locate data with personal information management system**

- Information stored in personal information system is transferrable to other locations and software programs.

4. **Design simple personal application that gives you reminders for each day. Identify the inputs to be taken, processing to be done, and the output to be produced . What multimedia components can be added to this application? BTL3**

The personal application for reminder is a simple and effective application that can be used in busy schedule for reminding the day to day activities.

Features of this application:

- Users can set / update date / time of particular event.
- The history data can be cleared.
- Priority of task can be set or changed.
- One can feed to-do list to the application.
- The meeting schedule can be input to the application. The remaining application will display the schedule one hour prior to actual schedule.
- The birthdays, anniversaries or important dates can be reminded on particular dates by flashing images, messages and ringing alarm. Users can stop the alarm or press ‘remind me’ after sometime button.
- Email data via, name of person, email address, phone number and so on can be used by the application as input. This feature can be set if user permits to do so.
- The day / date / time can be set according to appropriate time zone of the country.

The GUI for simple personal application that gives you reminders is as follows:

- **Input :** Name of the person, birthdate, anniversary date, meeting time, purpose of meeting, allotted timing for meeting.
- **Processing:** It involves making calculations, matching data against system date, matching person name, storing data for future use.
- **Output:** Displaying reminding information on the device, displaying date, ringing alarm, flashing light.

#### **Multimedia Components:**

- **Text:** The text is used for typing the input to the system as well for displaying the name of the event, detailed information about some schedules, to-do list, name of the person and so on.
- **Graphics:** The attractive graphics flashing as output on matching with date or time of particular event.
- **Image:** The image / photo of the persons can be displayed on the app while reminding the birthdays and anniversaries.
- **Audio:** Melodious songs or ringtone will be ringing for the reminding alarm.
- **Animation:** Animated images or text can be displayed on the device for reminding app on particular event.

**CS8251-Programming in c****L T PC3 0 0 3****UNIT I - BASICS OF C PROGRAMMING**

Introduction to programming paradigms - Structure of C program - C programming: Data Types –Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/output statements, Assignment statements – Decision making statements - Switch statement – Looping statements – Pre-processor directives - Compilation process

**UNIT II - ARRAYS AND STRINGS**

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode - Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search

**UNIT III -FUNCTIONS AND POINTERS**

Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

**UNIT IV-STRUCTURES**

Structure - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers – Self-referential structures – Dynamic memory allocation - Singly linked list -typedef.

**UNIT V- FILE PROCESSING**

Files – Types of file processing: Sequential access, Random access – Sequential access file- Example Program: Finding average of numbers stored in sequential access file - Random access file -Example Program: Transaction processing using random access files – Command line arguments.

**COURSE OUTCOMES:****Upon completion of the course, students will be able to**

- Develop simple applications in C using basic constructs
- Design and implement applications using arrays and strings
- Develop and implement applications in C using functions and pointers.
- Develop applications in C using structures.
- Design applications using sequential and random access file processing.

**TOTAL : 45 PERIODS****TEXT BOOKS:**

1. Reema Thareja, —Programming in C, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, —The C Programming language, Second Edition, Pearson Education, 2006 26

## **REFERENCES:**

1. Paul Deitel and Harvey Deitel, —C How to Program, Seventh edition, Pearson Publication
2. Juneja, B. L and Anita Seth, —Programming in C, CENGAGE Learning India pvt. Ltd., 2011
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.

## **TABLE OF CONTENT**

<b>CS8251-Programming in c</b>		
<b>Unit No</b>	<b>SYLLABUS</b>	<b>Page No.</b>
I	<b>BASICS OF C PROGRAMMING</b>	4-11
II	<b>ARRAYS AND STRINGS</b>	12-19
III	<b>FUNCTIONS AND POINTERS</b>	20-26
IV	<b>STRUCTURES</b>	27-34
V	<b>FILE PROCESSING</b>	35-40

**SubjectCode:CS8251**  
**Subject Name: PROGRAMMING IN C**

**Year/Semester:I/02**  
**Subject Handler: Ms.S.Scinthia Clarinda**

### **UNIT I ALGORITHMIC PROBLEM SOLVING**

Introduction to programming paradigms - Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process

#### **PART \* A**

<b>Q.No.</b>	<b>Questions</b>												
1.	<p><b>Define programming paradigm( Jan 2018) BTL1</b>  A programming paradigm is a fundamental style of programming that defines how the structure and basic elements of a computer program will be built. The style of writing programs and set of capabilities and limitations that a particular programming language has depends on the programming paradigm it supports.</p>												
2	<p><b>Give two examples for assignment statements. BTL1</b>  Syntax for assignment :  variable = expression / value ;  Example : x=100;y= a+b;</p>												
3	<p><b>Distinguish between character andstring.</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><b>No.</b></th><th style="text-align: center;"><b>Character</b></th><th style="text-align: center;"><b>String</b></th></tr> </thead> <tbody> <tr> <td style="text-align: center;">i.</td><td>It is a single character.</td><td>It is a sequence of characters.</td></tr> <tr> <td style="text-align: center;">ii.</td><td>It is enclosed by single quotes.</td><td>It is enclosed by double quotes.</td></tr> <tr> <td style="text-align: center;">iii.</td><td>Example : ‘C’</td><td>Example : “Computer”</td></tr> </tbody> </table>	<b>No.</b>	<b>Character</b>	<b>String</b>	i.	It is a single character.	It is a sequence of characters.	ii.	It is enclosed by single quotes.	It is enclosed by double quotes.	iii.	Example : ‘C’	Example : “Computer”
<b>No.</b>	<b>Character</b>	<b>String</b>											
i.	It is a single character.	It is a sequence of characters.											
ii.	It is enclosed by single quotes.	It is enclosed by double quotes.											
iii.	Example : ‘C’	Example : “Computer”											
4	<p><b>What are keywords? Give an example</b></p> <ul style="list-style-type: none"> <li>✓ Keywords are reserved words, they have standard and predefined meaning.</li> <li>✓ Keywords cannot be used as normal identifiers.</li> <li>✓ Example: auto, break, char, continue, else, if, switch, struct, union.</li> </ul>												

5	<p><b>What do you mean by variables in ‘C’? BTL1</b></p> <p>A variable is an identifier that is used to represent some specified type of information.</p> <p>Syntax : data_typevariable_name; Example: intmarks;</p>
6	<p><b>Identify the use of ternary or conditionaloperator.</b></p> <ul style="list-style-type: none"> <li>✓ ?: is known as conditional operator. It evaluates the first expression if the condition is true otherwise the second expression is evaluated.</li> <li>✓ Syntax: condition? exp1 : exp2;</li> </ul>
7	<p><b>What is mean by Operators precedence and associativity?</b></p> <ul style="list-style-type: none"> <li>✓ The precedence is used to determine how an expression involving more than one operator is evaluated.</li> <li>✓ The operator at higher level of precedence is evaluated first. The evaluation is based on PEMDASrule.</li> <li>✓ The operator of same precedence evaluated from either from left to right or right to left depending on level is known as associativity.</li> </ul>
8	<p><b>What is a compilationprocess?</b></p> <p>Compiler converts source code into executable code. It includes</p> <ul style="list-style-type: none"> <li>✓ Pre-processor</li> <li>✓ Compilation</li> <li>✓ Assembly</li> <li>✓ Linking</li> </ul>
9	<p><b>How to create enumeration constants?</b></p> <p>Enumerated data type is a user defined data type. Enumerated data type helps in creating a list of identifiers also called as symbolic numeric constants of type <code>int</code>. <code>enum</code> keyword is used to create enumeration constant.</p> <p><b>Syntax :</b> <code>enum identifier{value1, value2,.....,value n};</code></p> <p>Example : <code>enum holidays{sun, sat};</code></p>

10	<p><b>Differentiate between an expression and a statement inC.</b> (2018)BTL1</p> <table border="1"> <thead> <tr> <th>No.</th><th>Expression</th><th>Statements</th></tr> </thead> <tbody> <tr> <td>i.</td><td>Expression consists of operators and operands.</td><td>It is defined as a set of declaration or sequence of actions.</td></tr> <tr> <td>ii.</td><td>Example: a=29; b=a+77;</td><td>Example: Assignment statement Mark=73;</td></tr> </tbody> </table>	No.	Expression	Statements	i.	Expression consists of operators and operands.	It is defined as a set of declaration or sequence of actions.	ii.	Example: a=29; b=a+77;	Example: Assignment statement Mark=73;
No.	Expression	Statements								
i.	Expression consists of operators and operands.	It is defined as a set of declaration or sequence of actions.								
ii.	Example: a=29; b=a+77;	Example: Assignment statement Mark=73;								
11	<p><b>What is the output of the programs given below?</b>(2018)</p> <pre>#include &lt;stdio.h&gt; main( ) {     int a = 20, b = 10, c = 15, d = 5; int     e;     e = (a + b) * c / d;     printf("Value of (a + b) * c / d is : %d\n", e ); }</pre> <p><b>OUTPUT:</b> Value of (a + b) * c / d is : 90</p>									
12	<p><b>Generalize the types of I/O statements available in‘C’.</b></p> <p>Unformatted Input / Output statements</p> <ul style="list-style-type: none"> <li>✓ Input : <code>getc()</code>, <code>getchar()</code>, <code>gets()</code>, <code>getche()</code>, <code>getch()</code></li> <li>✓ Output: <code>putc()</code>, <code>putchar()</code>, <code>puts()</code>.</li> </ul> <p>Unformatted Input / Output statements</p> <ul style="list-style-type: none"> <li>✓ Input : <code>scanf()</code>, <code>fscanf()</code></li> <li>✓ Output : <code>printf()</code>, <code>fprintf()</code></li> </ul>									
13	<p><b>List the categories of Programming languages.</b> BTL1</p> <p>Programming languages are divided into the following categories:</p> <ul style="list-style-type: none"> <li>✓ Interpreted Programming language</li> <li>✓ Functional Programming language</li> <li>✓ Compiled Programming language</li> <li>✓ Procedural Programming language</li> <li>✓ Scripting Programming language</li> </ul>									

	<ul style="list-style-type: none"> <li>✓ Markup Programminglanguage</li> <li>✓ Logic-Based Programminglanguage</li> <li>✓ Concurrent Programminglanguage</li> <li>✓ Object Oriented ProgrammingLanguages</li> </ul>												
14	<p><b>Classify the different types of storage classes.BTL1</b></p> <p>There are mainly four types of storage classes. They are</p> <ul style="list-style-type: none"> <li>✓ Automatic(auto)</li> <li>✓ Static</li> <li>✓ External (extern)</li> <li>✓ Register</li> </ul>												
15	<p><b>Discover the meaning of Cpre-processor.BTL1</b></p> <ol style="list-style-type: none"> <li>1. The preprocessor contains any operations in the processing language, it will be transformed first.</li> <li>2. The preprocessing language consists of <ul style="list-style-type: none"> <li>✓ Inclusion of headerfile</li> <li>✓ Macroexpansion</li> <li>✓ Conditional compilation</li> <li>✓ Linecontrol</li> </ul> </li> </ol>												
16	<p><b>Invent the difference between ++a anda++..BTL1</b></p> <ul style="list-style-type: none"> <li>✓ ++a is known as pre increment where the value is incremented by one and then the operation is done.</li> <li>✓ a++ is known as post increment where the operation is done first and then the value is incremented by one.</li> </ul>												
17	<p><b>Give the differences between recursion and iteration. BTL1</b></p> <table border="1"> <thead> <tr> <th style="text-align: center;"><b>Recursion</b></th><th style="text-align: center;"><b>Iteration</b></th></tr> </thead> <tbody> <tr> <td>Function calls itself until the base condition is reached.</td><td>Repetition of process until the condition fails.</td></tr> <tr> <td>Only base condition (terminating condition) is specified.</td><td>It involves four steps: initialization, condition, execution and updation.</td></tr> <tr> <td>It keeps our code short and simple.</td><td>Iterative approach makes our code longer.</td></tr> <tr> <td>It is slower than iteration due to overhead of maintaining stack.</td><td>Iteration is faster.</td></tr> <tr> <td>It takes more memory than iteration due to overhead of maintaining stack.</td><td>Iteration takes less memory.</td></tr> </tbody> </table>	<b>Recursion</b>	<b>Iteration</b>	Function calls itself until the base condition is reached.	Repetition of process until the condition fails.	Only base condition (terminating condition) is specified.	It involves four steps: initialization, condition, execution and updation.	It keeps our code short and simple.	Iterative approach makes our code longer.	It is slower than iteration due to overhead of maintaining stack.	Iteration is faster.	It takes more memory than iteration due to overhead of maintaining stack.	Iteration takes less memory.
<b>Recursion</b>	<b>Iteration</b>												
Function calls itself until the base condition is reached.	Repetition of process until the condition fails.												
Only base condition (terminating condition) is specified.	It involves four steps: initialization, condition, execution and updation.												
It keeps our code short and simple.	Iterative approach makes our code longer.												
It is slower than iteration due to overhead of maintaining stack.	Iteration is faster.												
It takes more memory than iteration due to overhead of maintaining stack.	Iteration takes less memory.												

	<b>Differentiate switch( ) and nested-ifstatement</b>									
18	<table border="1"> <thead> <tr> <th>No.</th><th>Switch( )</th><th>Nested if</th></tr> </thead> <tbody> <tr> <td>i.</td><td>The switch( ) can test only constant values.</td><td>The if can evaluate relational or logical expressions.</td></tr> <tr> <td>ii.</td><td>In switch( ) case nested if can be used.</td><td>In nested if statements, switch( ) case can be used</td></tr> </tbody> </table>	No.	Switch( )	Nested if	i.	The switch( ) can test only constant values.	The if can evaluate relational or logical expressions.	ii.	In switch( ) case nested if can be used.	In nested if statements, switch( ) case can be used
No.	Switch( )	Nested if								
i.	The switch( ) can test only constant values.	The if can evaluate relational or logical expressions.								
ii.	In switch( ) case nested if can be used.	In nested if statements, switch( ) case can be used								
	<ul style="list-style-type: none"> <li>✓ Sequence generation is easier with recursion than using some nested iteration.</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>✓ Sometimes the logic behind recursion is hard to follow through.</li> <li>✓ Recursive calls are expensive (inefficient) as they take up a lot of memory and time. Recursive functions are hard to debug.</li> </ul>									
19	<p><b>Summarize the various types of C operators.</b></p> <ul style="list-style-type: none"> <li>✓ Arithmetic operators</li> <li>✓ Relational operators</li> <li>✓ Logical operators</li> <li>✓ Increment or decrement operators</li> <li>✓ Conditional or Ternary operators</li> <li>✓ Bitwise operators</li> <li>✓ Special operators (sizeof, &amp; and * , . and--&gt;)</li> </ul>									
20	<p><b>What is Pseudocode?</b> BTL2</p> <p>Pseudocode is a compact and informal high-level description of a program using the conventions of a programming language, but intended more for humans. Pseudocode does not contain programming level details like declaration of variables, looping syntax.</p>									
21	<p><b>List out the limitations of Flowchart.</b> BTL2</p> <ul style="list-style-type: none"> <li>✓ It is not easy to draw flow chart for some complex logic</li> <li>✓ Alteration and modifications are not easily done.</li> <li>✓ Reproduction or reuse of flowchart are very difficult.</li> <li>✓ Cost is very high.</li> </ul>									
22	<p><b>Write an algorithm to accept two numbers, compute the sum and print the result (Jan 2018)</b></p> <p>BTL2</p> <ul style="list-style-type: none"> <li>✓ Start</li> <li>✓ Read the two numbers a and b</li> <li>✓ Calculate sum=a +b</li> <li>✓ Display the sum</li> <li>✓ Stop</li> </ul>									
	<b>What is a global variable?</b>									

23	<p>Global variables are declared at the beginning of the program and it can be used inside any part of the program.</p> <pre>a=10; main( ) {     print("Value of a : %d",a); }</pre>
<b>PART * B</b>	
1	<p><b>What are the building blocks of an algorithm? Explain in detail. (16M) BTL3</b></p> <p><b>Answer: Page :1.19 - 1.24 – Dr. Ramesh Babu</b></p> <p>The building blocks of algorithm are (2M)</p> <ul style="list-style-type: none"> <li>✓ Statements – the instructions in the code</li> <li>✓ State - the state of the variable</li> <li>✓ Control flow – flow of the program</li> <li>✓ Functions - a block of code that performs a specific task</li> </ul> <p>Statements: There are 3 types of statement (5M)</p> <p>There are 3 types of statement</p> <ul style="list-style-type: none"> <li>✓ Input/Output Statement</li> </ul>
1	<ul style="list-style-type: none"> <li>✓ Assignment Statement</li> <li>✓ Control Statement</li> </ul> <p>State: There are 3 types of state (3M)</p> <ul style="list-style-type: none"> <li>✓ Initial state</li> <li>✓ Current state</li> <li>✓ Final state</li> </ul> <p>Control flow: (2M)</p> <ul style="list-style-type: none"> <li>✓ if</li> <li>✓ if – else</li> <li>✓ switch</li> </ul> <p>Repetition (2M)</p> <ul style="list-style-type: none"> <li>✓ while</li> <li>✓ for</li> </ul> <p>Functions: (2M)</p> <p>A function is a block of organized reusable code that is used to perform a single action.</p>

	<p><b>Explain Algorithmic problem solving in detail.(16M) BTL3</b>  <b>Answer:Page:1.11 - 1.16 – Dr. Ramesh Babu</b>          Steps – Explain each steps of the problemsolving</p>	(16M)
2	<pre> graph TD     A[Understand the problem] --&gt; B[Decide on: Computational means, exact vs. Approximate Solving data structure, Algorithmic design technique]     B --&gt; C[Design an Algorithm]     C --&gt; D[Prove Correctness]     D --&gt; E[Analyze the algorithm]     E --&gt; F[Code the Algorithm]     </pre> <p>The flowchart illustrates the six-step process of algorithmic problem solving. It begins with 'Understand the problem', followed by 'Decide on: Computational means, exact vs. Approximate Solving data structure, Algorithmic design technique'. This leads to 'Design an Algorithm', then 'Prove Correctness', 'Analyze the algorithm', and finally 'Code the Algorithm'. There is a feedback loop from 'Code the Algorithm' back to 'Decide on...', indicating iterative refinement.</p>	
3	<p><b>Describe pseudo code with its guidelines.(16M) BTL3</b>  <b>Answer: Page:1.25 - 1.27 – Dr. Ramesh Babu</b>          Pseudocode is an informal language used by programmer for human understanding rather than machineunderstanding.</p> <ul style="list-style-type: none"> <li>✓ Guidelines -Pseudo Code (3M)</li> <li>✓ Write one statementper line (3M)</li> <li>✓ CapitalizeInitialKeywords (2M)</li> </ul>	(3M) (3M) (2M) (2M)

	<ul style="list-style-type: none"> <li>✓ Indent to show hierarchy (2M)</li> <li>✓ End Multiline Structure (2M)</li> <li>✓ Keep statements language independent (2M)</li> </ul>
	<b>What is flowchart? Explain in detail (16M) BTL3</b> <b>Answer: Page:1.27 - 1.38 – Dr. Ramesh Babu</b> A flowchart is a pictorial representation of the algorithm defined in a sequence of steps and decisions needed to perform a process. (3M) Aim-flowchart (4M) <ul style="list-style-type: none"> <li>✓ Program preparation can be simplified using the flowchart</li> <li>✓ Flowchart are easier to understand at a glance.</li> <li>✓ Flowchart are easy to analyze and compare various methods</li> <li>✓ Flowchart assist in reviewing and debugging of a program</li> <li>✓ Flowchart provide effective programming documentation</li> </ul>
4	<b>Symbols- flowchart (5M)</b> <b>Structure in Flowchart (4M)</b> <ul style="list-style-type: none"> <li>✓ Sequence Structure</li> <li>✓ Selection structure</li> <li>✓ Loop structure</li> </ul>
	<b>Write an algorithm and give the flowchart to find the net salary of an employee. (16M) BTL1</b> <b>Answer: Page:1.59 – 1.60 Dr. Ramesh Babu</b> Algorithm (5M) <p style="margin-left: 40px;">Step 1: Start</p> <p style="margin-left: 40px;">Step 2 : Read the basic salary</p> <p style="margin-left: 40px;">Step 3 : IF the basic is greater than or equal to 4000 ELSE Goto Step 4</p> <p style="margin-left: 80px;">Step 3.1 : DA = 0.32 * basic (Dearness Allowance)</p> <p style="margin-left: 80px;">Step 3.2 : HRA = 0.15 * basic (House Rent Allowance)</p> <p style="margin-left: 80px;">Step 3.3 : CCA = 325 (City Compensatory Allowance)</p> <p style="margin-left: 80px;">Step 3.4 : Net Salary = basic + DA HRA + CCA</p> <p style="margin-left: 40px;">Step 4 : Print the Net Salary</p> <p style="margin-left: 40px;">Step 5 : Stop</p>
5	Flowchart (8M) Explanation (3M)

6	<p><b>Write the program to Guess an integer between 0 to 100. (16M) BTL1</b></p> <p><b>Answer: Page:1.59- 1.60 – Dr. Ramesh Babu</b></p>
	<pre>importrandom randomNumber = random.randrange(0,100) print("Random number has been generated") guessed = False while guessed==False:     userInput = int(input("Your guess pleas: "))     if userInput==randomNumber:         guessed = True</pre> <p>(13M)</p>

	<pre> print("Well done!") elif userInput&gt;100:     print("Our guess range is between 0 and 100, please try a bit lower") elif userInput&lt;0:     print("Our guess range is between 0 and 100, please try a bit higher") elif userInput&gt;randomNumber:     print("Try one more time, a bit lower") elif userInput &lt; randomNumber:     print("Try one more time, a bit higher") print("End of program") </pre> <p>Explanation (3M)</p>
7	<p><b>Describe the structure of a C program with an example. BTL1 (13M)</b></p> <ul style="list-style-type: none"> <li>✓ Structure is a user-defined datatype in C language which allows us to combine data of different types together.</li> <li>✓ Structure helps to construct a complex data type which is more meaningful. It is somewhat similar to an Array, but an array holds data of similar type only. But structure on the other hand, can store data of any type, which is practical more useful.</li> <li>✓ <b>For example:</b> If I have to write a program to store Student information, which will have Student's name, age, branch, permanent address, father's name etc, which included string values, integer values etc, how can I use arrays for this problem, I will require something which can hold data of different types together.</li> <li>✓ In structure, data is stored in form of <b>records</b></li> </ul> <p>(3M)</p>
8	<p><b>Write an algorithm to find the minimum number in a list. (16M)BTL4</b></p> <p><b>Answer: Page:1.75-1.76 – Dr. Ramesh Babu</b></p> <ul style="list-style-type: none"> <li>✓ Algorithm (5M)</li> <li>✓ Pseudocode (3M)</li> <li>✓ Flowchart (5M)</li> <li>✓ Explanation (3M)</li> </ul>

9	<p><b>Illustrate the Tower of Hanoi (16M) (Jan -2018) BTL4</b></p> <p><b>Answer:Page:1.83-1.85 – Dr. Ramesh Babu</b></p> <ul style="list-style-type: none"> <li>✓ Algorithm <span style="float: right;">(3M)</span></li> </ul> <pre>def TowerOfHanoi(n , from_rod, to_rod, aux_rod): if n == 1:     print "Move disk 1 from rod",from_rod,"to rod",to_rod     return</pre>
	<pre>TowerOfHanoi(n-1, from_rod, aux_rod,to_rod) print "Move disk",n,"from rod",from_rod,"to rod",to_rod TowerOfHanoi(n-1, aux_rod, to_rod,from_rod) n = 4 TowerOfHanoi(n, '\A\', '\C\', '\B\')</pre> <ul style="list-style-type: none"> <li>✓ Diagram <span style="float: right;">(5M)</span></li> <li>✓ Flowchart <span style="float: right;">(5M)</span></li> <li>✓ Explanation <span style="float: right;">(3M)</span></li> </ul>

## UNIT II - ARRAYS AND STRINGS

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode - Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search

### PART \* A

Q.No.	Questions
1.	<p><b>List out the features of Arrays.</b></p> <ul style="list-style-type: none"> <li>✓ An array is used to represent a collection of elements of same datatype.</li> <li>✓ The elements in an array can be accessed by using the baseaddress.</li> <li>✓ The elements are stored in continuous memory locations, The starting memory location is known as the array name and it is known as thebase address (index ) of thearray.</li> </ul>
2	<p><b>Define a float array of size 5 and assign 5 values to it.</b></p> <pre>main() {     float a[5] = {26.9, 32.4, 84.2, 20.0, 78.1}; }</pre>
3	<p><b>Identify the main elements of an array declaration.</b></p> <ul style="list-style-type: none"> <li>✓ Arrays are declared like variable declaration but the array declarationhas size of thearray.</li> </ul> <p><b>Syntax :</b>data_type array_name[size];</p> <p><b>[OR]</b></p> <pre>data_type array_name[array_size]={list_of_values};</pre> <p>Example for array declaration : int marks[6];</p>

4	<p><b>Point out an example code to express two dimensionalarray.</b></p> <ul style="list-style-type: none"> <li>✓ A two dimensional array is created by specifying its row and columnsize.</li> </ul> <p>Examples : int matrix[2][2]; int a[3][2];</p>
5	<p><b>How to create a two dimensionalarray?</b></p> <ul style="list-style-type: none"> <li>✓ Two dimensional arrays are stored in a row-column matrix, where the left index indicates the row and right matrix indicates the column.</li> <li>✓ <b>Syntax :</b> data_type array_name[row_size][column_size];</li> </ul> <p>Example : int mat[3][3];</p>
6	<p><b>What are the different ways of initializingarray?</b></p> <ul style="list-style-type: none"> <li>✓ Values can be assigned to an array by normal declaration otherwise they hold garbagevalues.</li> <li>✓ Arrays can be initialized in following two ways: <ul style="list-style-type: none"> <li>i. At compiletime</li> <li>ii. At Runtime</li> </ul> </li> </ul>
7	<p><b>What is the use of '\0' and "%s"?</b></p> <ul style="list-style-type: none"> <li>✓ '\0' is the escape sequence for null character it is automatically added at the end of thestring.</li> <li>✓ '%s' is a format specifier for string. It is used in scanf( ) and printf( ) functions to get the string input or to print stringoutput</li> </ul>
8	<p><b>What is the role of strrev()?</b></p> <p>The function strrev( ) is used to reverse a string. This function takes only one argument and return only one argument</p>

9	<p><b>What do you meant by an assignment statement? BTL1</b></p> <p>An assignment statement creates new variables and gives them values:</p> <p>Eg 1: Message = 'And now for something completely different'</p> <p>Eg 2: n = 17</p>																				
10	<p><b>Define string.</b></p> <ul style="list-style-type: none"> <li>✓ String is a sequence / array of characters enclosed with doublequotes.</li> <li>✓ Null character ('\0') is used to mark the end of the string</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>C</td><td>O</td><td>M</td><td>P</td><td>U</td><td>T</td><td>E</td><td>R</td><td>\0</td></tr> </table> <p><b>Example :</b> char word= "computer";</p>	C	O	M	P	U	T	E	R	\0											
C	O	M	P	U	T	E	R	\0													
11	<p><b>Name any two library functions used for string handling.</b></p> <ul style="list-style-type: none"> <li>✓ strlen() – finds the length of a string. It returns an integer value. It counts the number of characters except null character and returns the count</li> </ul> <p><b>Syntax :</b>strlen(str)</p> <ul style="list-style-type: none"> <li>✓ strcpy() – copies the source string into destination string. So, the source string should be enough to store the destinationstring.</li> </ul> <p><b>Syntax :</b> strcpy(source,destination)</p>																				
12	<p><b>Definesorting.</b></p> <ul style="list-style-type: none"> <li>✓ Sorting is a process of arranging the elements either in ascending order or descending order.</li> <li>✓ Sorting refers to ordering data in an increasing or decreasing fashion according to some linear relationship among the data items.</li> <li>✓ Sorting can be done on names, numbers and records.</li> </ul>																				
14	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">101</td><td style="width: 10%;">102</td><td style="width: 10%;">103</td><td style="width: 10%;">104</td><td style="width: 10%;">105</td><td style="width: 10%;">106</td><td style="width: 10%;">107</td><td style="width: 10%;">108</td><td style="width: 10%;">109</td><td style="width: 10%;">110</td></tr> <tr> <td>a[0]</td><td>a[1]</td><td>a[2]</td><td>a[3]</td><td>a[4]</td><td>a[5]</td><td>a[6]</td><td>a[7]</td><td>a[8]</td><td>a[9]</td></tr> </table> <p><b>Given an array int a[10]={101,102,103,104,105,106,107,108,109,110}.</b></p> <p><b>Show the memory representation and calculate its length.</b></p> <p><b>Memory Representation:Length calculation:</b></p>	101	102	103	104	105	106	107	108	109	110	a[0]	a[1]	a[2]	a[3]	a[4]	a[5]	a[6]	a[7]	a[8]	a[9]
101	102	103	104	105	106	107	108	109	110												
a[0]	a[1]	a[2]	a[3]	a[4]	a[5]	a[6]	a[7]	a[8]	a[9]												

	<p>Length of an array=upper_bound - lower_bound + 1 Here, upper_bound = 9 and lower_bound = 0 Thus, length of an array = 9-0+1 = 10</p>															
15	<p><b>What are the types of sorting available inC?</b></p> <ul style="list-style-type: none"> <li>✓ Insertionsort.</li> <li>✓ MergeSort.</li> <li>✓ QuickSort.</li> <li>✓ RadixSort.</li> <li>✓ HeapSort</li> <li>✓ Selection sort</li> <li>✓ Bubblesort</li> </ul>															
16	<p><b>What is function call? BTL1</b> A function is a named sequence of statements that performs a computation. When we define a function, we specify the name and the sequence of statements. Later, we can call the function by its name called as functioncall.</p>															
17	<p><b>What is the difference between an array and pointer?</b></p> <table border="1"> <thead> <tr> <th>No.</th> <th>Array</th> <th>Pointer</th> </tr> </thead> <tbody> <tr> <td>i.</td> <td>Array allocates space automatically.</td> <td>Pointer is explicitly assigned to point to an allocated space</td> </tr> <tr> <td>ii.</td> <td>It cannot be resized</td> <td>It can be resized using realloc ()</td> </tr> <tr> <td>iii.</td> <td>It cannot be reassigned</td> <td>Pointers can be reassigned.</td> </tr> <tr> <td>iv.</td> <td>Size of(array name) gives the number of bytes occupied by the array.</td> <td>Sizeof(pointer name) returns the number of bytes used to store the pointer variable.</td> </tr> </tbody> </table>	No.	Array	Pointer	i.	Array allocates space automatically.	Pointer is explicitly assigned to point to an allocated space	ii.	It cannot be resized	It can be resized using realloc ()	iii.	It cannot be reassigned	Pointers can be reassigned.	iv.	Size of(array name) gives the number of bytes occupied by the array.	Sizeof(pointer name) returns the number of bytes used to store the pointer variable.
No.	Array	Pointer														
i.	Array allocates space automatically.	Pointer is explicitly assigned to point to an allocated space														
ii.	It cannot be resized	It can be resized using realloc ()														
iii.	It cannot be reassigned	Pointers can be reassigned.														
iv.	Size of(array name) gives the number of bytes occupied by the array.	Sizeof(pointer name) returns the number of bytes used to store the pointer variable.														
18	<p><b>Mention the various String Manipulation Functions inC.</b></p> <ul style="list-style-type: none"> <li>✓ strcpy(s1,s2); Copies string s2 into strings1.</li> <li>✓ strcat(s1,s2); Concatenates string s2 onto the end of strings1.</li> <li>✓ strlen(s1); Returns the length of strings1.</li> </ul>															

	<ul style="list-style-type: none"> <li>✓ strcmp(s1,s2); Returns 0 if s1 and s2 are the same; less than 0 if s1&lt;s2; greater than 0 if s1&gt;s2.</li> <li>✓ strchr(s1,ch); Returns a pointer to the first occurrence of character ch in string s1.</li> <li>✓ strstr(s1,s2); Returns a pointer to the first occurrence of string s2 in string s1.</li> </ul>
19	<p><b>What is the use of atoi()function?</b></p> <ul style="list-style-type: none"> <li>✓ C allows us to manipulate characters the same way we do with numbers. Whenever a character constant or character variable is used in an expression, it is automatically converted into integer value by the system.</li> <li>✓ For eg, if the machine uses the ASCII representation, then, x = 'a'; printf("%d \n",x); will display the number 97 on the screen.</li> <li>✓ The C library supports a function that converts a string of digits into their integer values.</li> </ul>
20	<p><b>What is scope of variable? BTL1</b></p> <p>Variable has scope i.e up to which line it can be used. Its depends where you declared. Variables declared inside the functions are local variable, its scope is only inside the function, not outside the function.</p>
21	<p><b>Define Searching.</b></p> <ul style="list-style-type: none"> <li>✓ Searching is a process of finding the position of a given element in a list.</li> <li>✓ The searching is successful if the element is found. There are two types of searching. <ul style="list-style-type: none"> <li>▪ Linear Search</li> <li>▪ Binary Search</li> </ul> </li> </ul>
22	<p><b>Define Bubblesort.</b></p> <ul style="list-style-type: none"> <li>✓ A simple but popular sorting algorithm. Bubble sorting is used frequently as a programming exercise because it is relatively easy to understand.</li> <li>✓ It is not, however, particularly efficient. Other sorting algorithms, such as heap sorts, merge sorts and quick sorts, are used more often in real applications.</li> </ul>

23	<p><b>Write a c program to find a number is even or odd</b> BTL2 num</p> <pre>= int(input("Enter a number: ")) if (num % 2) == 0:     print("{0} is Even".format(num)) else:     print("{0} is Odd".format(num))</pre>
24	<p><b>Write a C program to find a factorial of a number</b> BTL2 num</p> <pre>= float(input("Enter a number: ")) if num &gt; 0:     print("Positive number") elif num == 0:     print("Zero") else:     print("Negative number")</pre>
25	<p><b>Write a Cprogram to find a GREATEST 3 of a number</b> BTL2</p> <pre>num1 = 10 num2 = 14</pre>
	<pre>num3 = 12 num1 = float(input("Enter first number: ")) #num2 = float(input("Enter second number: ")) #num3 = float(input("Enter third number: "))  if (num1 &gt;= num2) and (num1 &gt;= num3):     largest = num1 elif (num2 &gt;= num1) and (num2 &gt;= num3):     largest = num2 else:     largest = num3  print("The largest number between", num1, ", ", num2, "and", num3, "is", largest)</pre>
	<b>PART * B</b>
1.	<p><b>What is the role of an interpreter? Give a detailed note on python interpreter and interactive mode of operation.(16M)</b> BTL3</p> <p><b>Answer:Page:2.24- 2.26 Dr.V.Ramesh</b></p> <p>Interpreter- processes the program (6M)</p> <p>Two Types of modes (10M)</p> <p>Interactive Mode – displays the result immediately &gt;&gt;&gt;2+2 4</p> <p>Script mode-store and execute the program</p>

	<p><b>List down the rules for naming the variable with example. (16M) BTL3</b></p> <p><b>Answer:Page:2.36-Dr.V.Ramesh</b></p> <p>Rules for writing the variable (10M)</p> <ul style="list-style-type: none"><li>✓ Variables names must start with a letter or an underscore, suchas: _underscore underscore_</li><li>✓ The remainder of your variable name may consist of letters, numbers andunderscores. password1 n00b un_der_scores</li><li>Names are casesensitive. case_sensitive, CASE_SENSITIVE, and Case_Sensitive are each a different variable.</li></ul> <p>Example Program (6M)</p> <pre>&gt;&gt;&gt; a_var=10 &gt;&gt;&gt;print a_var 10</pre>
2	

3	<p><b>What is operator? Explain operators in C. (Jan 2018) (16M) BTL2</b></p> <p><b>Answer:Page:2.65 Dr.V.Ramesh</b></p> <p>Operator</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Performs an operation on operands</li> <li><input type="checkbox"/> &gt;&gt;&gt;3+3 (3M)</li> <li>Types (10M)</li> <li><input type="checkbox"/> ArithmeticOperators.</li> <li><input type="checkbox"/> Comparison (Relational)Operators.</li> <li><input type="checkbox"/> AssignmentOperators.</li> <li><input type="checkbox"/> LogicalOperators.</li> <li><input type="checkbox"/> BitwiseOperators.</li> <li><input type="checkbox"/> MembershipOperators.</li> <li><input type="checkbox"/> IdentityOperators.</li> </ul> <p>Example Program for each operator (3M)</p> <pre>&gt;&gt;&gt;2+3 5 &gt;&gt;&gt;2&gt;3 False &gt;&gt;&gt;a=10 &gt;&gt;&gt;print a 10 &gt;&gt;&gt; 10 in [10,20,30] True</pre>						
4	<p><b>Outline the operator precedence in C (Jan 2018) (16M) BTL3</b></p> <p><b>Answer: Page: 2.79 Dr.V.Ramesh</b></p> <p>Operator Precedence (3M)</p> <p>-order of execution</p> <p>Tabulation with rules (10M)</p> <table border="1"> <thead> <tr> <th><b>Precedence</b></th><th><b>Operators</b></th></tr> </thead> <tbody> <tr> <td>High</td><td>*/ %</td></tr> <tr> <td>Low</td><td>+-</td></tr> </tbody> </table> <ol style="list-style-type: none"> <li>1. Parentheses (simplify inside'em)</li> <li>2. Exponents</li> <li>3. Multiplication and Division (from left to right)</li> <li>4. Addition and Subtraction (from left to right)</li> </ol> <p>Explanation (3M)</p>	<b>Precedence</b>	<b>Operators</b>	High	*/ %	Low	+-
<b>Precedence</b>	<b>Operators</b>						
High	*/ %						
Low	+-						

5

**(i) Write a C program to exchange the value of two variable (ii) Write a python program using function to find the sum of first „n” even numbers and print the result (Jan 2018) (16 M) BTL2**

**Answer:(i) Page: SP.5-Dr.V.Ramesh (ii) Page: SP.10-DR.V.Ramesh**

(i) Progra

m: (8M)

x = 5

y = 10

# create a temporary variable and swap the values

temp = x

x = y

y = temp

print('The value of x after swapping:

{ }'.format(x)) print('The value of y after

swapping: { }'.format(y))

(ii) Program:

def

evensum(n):

(8M)

curr = 2

sum = 0

i = 1

# sum of first n even

numbers while i <= n:

sum += curr

# next even

number curr += 2

i = i +

1 return

sum

# Driver

Code n = 20

print("sum of first ", n, "even number is: ", evensum(n))

7	<p><b>Write a program to circulate the value of n variable?(16M) BTL3</b></p> <p><b>Answer:Page:2.98-DR.V.Ramesh</b></p> <p><b>Program</b> (12M)</p> <pre># Circulate the values of n variables  no_of_terms = int(input("Enter number of values : ")) list1 = [] for val in range(0,no_of_terms,1):     ele = int(input("Enter integer : "))     list1.append(ele)  print("Circulating the elements of list ", list1) for  val in range(0,no_of_terms,1):     ele = list1.pop(0)     list1.append(ele)     print(list1)</pre> <p><b>Output (2M)</b></p> <p><b>Explanation (2M)</b></p>
8	<p><b>What is function? How it is defined? Explain the flow of execution(16M) BTL3</b></p> <p><b>Answer: Page:3.28-DR.V.Ramesh</b></p> <p>✓ -Group of statement (6M)</p>
	<ul style="list-style-type: none"> <li>✓ -should be called</li> <li>✓ -executes when called</li> <li>✓ Syntax of Function (6M)</li> <li>✓ def functionname(parameters):</li> <li>✓ ///statements</li> <li>✓ Example (4M)</li> </ul>

**Explain about the String Arrays and its manipulation in detail .BTL1**

Few commonly used string handling functions are discussed below:

Function	Work of Function
<code>strlen()</code>	computes string's length
<code>strcpy()</code>	copies a string to another
<code>strcat()</code>	concatenates(joins) two strings
<code>strcmp()</code>	compares two strings
<code>strlwr()</code>	converts string to lowercase
<code>strupr()</code>	converts string to uppercase

Strings handling functions are defined under "string.h" header file.

```
#include <string.h>
```

### UNIT III FUNCTIONS AND POINTERS

**Introduction to functions:** Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference

#### PART \* A

Q.No	Questions
1	<p><b>What is a function?</b></p> <ul style="list-style-type: none"> <li>✓ Function is a set of instructions</li> <li>✓ Self-contained block</li> <li>✓ Performs a specific task</li> </ul> <p>Used to avoid redundancy of code.</p>
2	<p><b>List operators supported in CBT2</b></p> <p>Arithmetic Operators.      Relational Operators.      Assignment Operators.      Logical Operators.      Membership Operators.      Identity Operators.      Bitwise Operators.</p>
3	<p><b>What is the need for functions?</b></p> <ul style="list-style-type: none"> <li>✓ To reduce the complexity of large programs</li> <li>✓ To increase the readability</li> <li>✓ To achieve reusability</li> <li>✓ To avoid redundancy of code</li> <li>✓ To save Memory</li> </ul>

4	<p><b>What are the uses of pointer?</b></p> <ul style="list-style-type: none"> <li>✓ Saves MemorySpace</li> <li>✓ Used for dynamic memory allocation</li> <li>✓ Faster execution.</li> <li>✓ Used to pass array of values to a function as a single argument.</li> </ul>
5	<p><b>Define Iteration.</b> BTL1</p> <p>Computers are often used to automate repetitive tasks. Repeating identical or similar tasks without making errors is something that computers do well and people do poorly. In a computer program, repetition is also called <b>iteration</b>.</p>
6	<p><b>Write the syntax for while statement.</b> BTL2</p> <p>While loop is used to execute number of statements or body till the condition passed in while is true. Once the condition is false, the control will come out of the loop. Here, body will execute multiple times till the expression passed is true. The Body may be a single statement or multiple statement.</p> <p><b>Syntax:</b> while &lt;expression&gt;:                   statements</p>
7	<p><b>Define for loop with syntax</b> BTL1</p> <p>The for loop processes each item in a sequence, so it is used with Python's sequence data types—strings, lists, and tuples. Each item in turn is (re-)assigned to the loop variable, and the body of the loop is executed. The general form of a for loop is: It has a header terminated by a colon (:) and a body consisting of a sequence of one or more statements indented the same amount from the header.</p> <p><b>For LOOP_VARIABLE in SEQUENCE:</b></p>
8	<p><b>Define break statement.</b> BTL1</p> <p>Break statement is a jump statement that is used to pass the control to the end of the loop. When break statement is applied the control points to the line following the body of the loop hence applying break statement makes the loop to terminate and control goes to next line pointing after loop body.</p>
	<p><b>Define continue statement with syntax.</b> BTL1</p> <p>Continue Statement is a jump statement that is used to skip the present iteration and forces next iteration of loop to take place. It can be used in while as well as for loop statements.</p>

9		While<condition>: Statement1 Statement2 If<condition>: Continue Statement3 Statement4	
10		<b>Define Typedef.</b> ✓ The typedef keyword enables the programmer to create a new data type name by using an existing datatype. ✓ By using typedef, no new data is created, rather an alternate name is given to a known datatype.	
11		<b>Define Fruitful function.</b> BTL1 Fruitful functions are those that return a value. Such as the math functions, yield results; for lack of a better name, I call them <b>fruitful functions</b> .	
12		<b>What are the types of variables based on scope?</b> BTL2 There are two types of variables based on Scope: ✓ LocalVariable.	

	<ul style="list-style-type: none"> <li>✓ GlobalVariable</li> </ul>
13	<p><b>Explain local variable and global variable BTL3</b></p> <p>Variables declared <b>inside a function body</b> is known as Local Variable. These have a local access thus these variables cannot be accessed outside the function body in which they are declared.</p> <p>Variable defined <b>outside the function</b> is called Global Variable.</p> <p>Global variable is accessed all over program thus global variable have widest accessibility.</p>
14	<p><b>Compare actual parameter &amp; formal argument.</b></p> <ul style="list-style-type: none"> <li>✓ <b>Actual argument:</b> Specified in the function call statement. Used to supply the input values to the function either by copy or reference</li> <li>✓ <b>Formal argument:</b> Specified in the function definition statement. It takes either copy or address of the actual arguments</li> </ul>
15	<p><b>How is pointer arithmetic done?(2017)</b></p> <p>Pointer Arithmetic:</p> <p>Valid operation</p> <ul style="list-style-type: none"> <li>✓ Pointer can be added with a constant</li> <li>✓ Pointer can be subtracted with a constant</li> <li>✓ Pointer can be Incremented or Deccremented Not Valid</li> </ul> <p>Two pointers can not be added, subtracted, multiplied or divided</p> <p><b>Ex:</b> int a=10</p> <pre>int *p=&amp;a; p=p+1;</pre> <p>The pointer holds the address 2000. This value is added with 1. The data type size of the constant is added with the address. <math>p=2000+(2*1)=2002</math></p> <p>:</p>

16	<p><b>Define Strings? BTL1</b></p> <p>A string is a sequence of characters. You can access the characters one at a time with the bracket operator []. String pythons are immutable (cannot be modified). In Python, Strings are stored as individual characters in a contiguous memory location. The benefit of using String is that it can be accessed from both the directions in forward and backward. Both forward as well as backward indexing are provided using Strings in Python.</p> <ul style="list-style-type: none"> <li>✓ Forward indexing starts with 0,1,2,3,</li> <li>✓ Backward indexing starts with -1,-2,-3,-4 ...</li> </ul>
17	<p><b>What are the types of operators supported by string? BTL1</b></p> <ul style="list-style-type: none"> <li>✓ BasicOperators.</li> <li>✓ MembershipOperators.</li> <li>✓ RelationalOperators.</li> </ul>
18	<p><b>What is a functionprototype?</b></p> <ul style="list-style-type: none"> <li>✓ Function prototype is a function declaration statement.</li> <li>✓ <b>Syntax :</b> return_type function_name( parameters_list)</li> <li>✓ <b>Example:</b> int factorial(int);</li> </ul>

19	<p><b>Differentiate call by value and call byreference.</b></p> <ul style="list-style-type: none"> <li>✓ <b>Call by value:</b> The values of the variables are passed by the calling function to the called function.</li> <li>✓ <b>Call by reference:</b> The addresses of the variables are passed by the calling function to the called function.</li> </ul>
20	<p><b>Differentiate for loop and while loop.</b> For loops works only with sequence whereas While loop works with numbers</p>
21	<p><b>List the header files in ‘C’language.</b></p> <ul style="list-style-type: none"> <li>✓ &lt;stdio.h&gt; contains standard I/Ofunctions</li> <li>✓ &lt;ctype.h&gt; contains character handlingfunctions</li> <li>✓ &lt;stdlib.h&gt; contains general utilityfunctions</li> <li>✓ &lt;string.h&gt; contains string manipulationfunctions</li> <li>✓ &lt;math.h&gt; contains mathematical functions</li> <li>✓ &lt;time.h&gt; contains time manipulationfunctions</li> </ul>
22	<p><b>What are the steps in writing a function in a program?</b></p> <p><b>Function Declaration (Prototype declaration):</b></p> <ul style="list-style-type: none"> <li>✓ Every user-defined functions has to be declared before themain().</li> </ul> <p><b>Function Callings:</b></p> <ul style="list-style-type: none"> <li>✓ The user-defined functions can be called inside any functions like main(), user defined function,etc.</li> </ul> <p><b>Function Definition:</b></p> <ul style="list-style-type: none"> <li>✓ The function definition block is used to define the user-defined functions withstatements.</li> </ul>
23	<p><b>Write the syntax for pointers tostructure.</b></p> <pre>Struct S { char datatype1; int datatype2; float datatype3; };  Struct S *sptr //sptr ia pointer to structure S</pre>

24	<p><b>What is meant by Recursivefunction?</b></p> <ul style="list-style-type: none"> <li>✓ If a function calls itself again and again, then that function is called Recursivefunction.</li> </ul> <p><b>Example:</b></p> <pre>void recursion() {     recursion(); /* function calls itself */ } int main() {     recursion(); }</pre>
25	<p><b>Name the type of Boolean operators.</b></p> <ol style="list-style-type: none"> <li>1. True</li> <li>2. False</li> </ol>
1	<p style="text-align: center;"><b>Part * B</b></p> <p><b>(i) What are Conditional execution? Explain in detail. (ii) Define Iteration. Briefly discuss looping statements in detail (Jan 2018) (16M )BTL1</b></p> <p><b>Answer: (i) Page:2.95-DR.V.Ramesh (ii) Page:2.102-Dr.V.Ramesh</b></p> <p>(i) Condition true - execute (2M)</p> <p>Types of conditional execution with example program foreach (6M)</p> <ul style="list-style-type: none"> <li>✓ If</li> <li>✓ If ...else</li> <li>✓ If ...elif.. else</li> </ul> <p><b>(ii) Repeated execution up to some condition true (2M)</b></p>

	<p>Types of iteration with example program for each (6M)</p> <ul style="list-style-type: none"> <li>✓ <b>For</b></li> <li>✓ <b>While</b></li> <li>✓ <b>While ...else</b></li> <li>✓ <b>BreakContinue</b></li> </ul>
	<p><b>Describe about pointers and their operations that can be performed on it.</b></p> <p>C provides two pointer operators, which are (a) Address of Operator &amp; and (b) Indirection Operator *.</p> <p>A pointer is a variable that contains the address of another variable or you can say that a variable that contains the address of another variable is said to "point to" the other variable. A variable can be any data type including an object, structure or again pointer itself.</p> <p>The . (dot) operator and the -&gt; (arrow) operator are used to reference individual members of classes, structures, and unions.</p> <p><b>The Address of Operator &amp;</b></p> <p>2 The &amp; is a unary operator that returns the memory address of its operand. For example, if var is an integer variable, then &amp;var is its address. This operator has the same precedence and right-to-left associativity as the other unary operators.</p> <p>You should read the &amp; operator as "<b>the address of</b>" which means <b>&amp;var</b> will be read as "the address of var".</p> <p><b>The Indirection Operator *</b></p> <p>The second operator is indirection Operator *, and it is the complement of &amp;. It is a unary operator that returns the value of the variable located at the address specified by its operand.</p> <p>The following program executes the two operations</p> <pre>#include&lt;iostream&gt;  using namespace std;  int main () { intvar; int*ptr; int val;  var=3000;  // take the address of var }</pre>
	<p>JIT-JEPPIAAR/IT/I<sup>st</sup> Yr/SEM 01/CS8251 PROGRAMMING IN C/UNIT 1-5/QB+Keys/ ver 3.0</p>

```

ptr =&var;

// take the value available at ptr
val =*ptr;
cout <<"Value of var :"<<var<< endl;
cout <<"Value of ptr :"<< ptr << endl;
cout <<"Value of val :"<< val << endl;

return0;
}

```

When the above code is compiled and executed, it produces the following result –

```

Value of var :3000
Value of ptr :0xbff64494
Value of val :3000

```

**Discuss in detail about the string functions and methods. (16M) BTL 4**

**Answer:Page:3.65-DR.V.Ramesh**

List of string functions with example

3	(16M)
	<ul style="list-style-type: none"> <li>✓ strrev()</li> <li>✓ toupper()</li> <li>✓ tolower()</li> <li>✓ isdigit()</li> <li>✓ isalpha()</li> <li>✓ capitalize()</li> <li>✓ find()</li> <li>✓ split()</li> </ul>

	<pre> else:     return n*recur factorial(n-1) </pre>
5	<p><b>Write a C program to print N Fibonacci series (Jan 2018) (8M) BTL6</b></p> <p><b>Answer:Page: 3.50-DR.V.Ramesh Fibonacci</b></p> <p><b>Series using Recursion</b> def fib(int n):</p> <pre> if (n &lt;= 1): return n; return fib(n-1) + fib(n-2); n = 9; print(fib(n)); </pre>
6	<p><b>Write a program to find sum of array and exponentiation[16M] BTL6</b></p> <p><b>Answer:Page:3.51-DR.V.Ramesh Sum of</b></p> <p><b>array</b> (6M)</p> <pre> a = [6,7,29,4,6,7,8,9] acc = 0 for i in a: acc += i print acc </pre> <p><b>Exponentiation</b></p> <pre> (10M) def power(base,exp): if(exp==1):     return(base) if(exp!=1):         return(base*power(base,exp-1)) base=int(input("Enter base: ")) exp=int(input("Enter exponential value: ")) print("Result:",power(base,exp)) </pre>
7	<p><b>Explain linear search with example (Jan 2018) (16M) BTL6</b></p> <p><b>Answer:Page:4.48 DR.V.Ramesh</b></p> <p>Diagram representation (8M)</p> <p>Program (8M)</p>

8	<p><b>Explain binary search with example(16M) BTL6</b></p> <p><b>Answer:Page:4.50-DR.V.Ramesh</b></p> <p>Diagram representation (8M)</p> <p>Program (8M)</p>
---	--

<b>UNIT – IV -STRUCTURES</b>											
	Structure - Nested structures – Pointer and Structures – Array of structures – <b>Example Program</b> using structures and pointers – Self-referential structures – Dynamic memory allocation - Singly linked list-typedef										
<b>PART * A</b>											
1	<p><b>Compare arrays and structures.</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;"><b>Arrays</b></th><th style="text-align: center; padding: 5px;"><b>Structures</b></th></tr> </thead> <tbody> <tr> <td style="padding: 5px;">An array is a collection of data items of same data type. Arrays can only be declared.</td><td style="padding: 5px;">A structure is a collection of data items of different data types. Structures can be declared and defined.</td></tr> <tr> <td style="padding: 5px;">There is no keyword for arrays.</td><td style="padding: 5px;">The keyword for structures is struct.</td></tr> <tr> <td style="padding: 5px;">An array cannot have bit fields.</td><td style="padding: 5px;">A structure may contain bit fields.</td></tr> <tr> <td style="padding: 5px;">An array name represents the address of the starting element.</td><td style="padding: 5px;">A structure name is known as tag. It is a Shorthand notation of the declaration.</td></tr> </tbody> </table>	<b>Arrays</b>	<b>Structures</b>	An array is a collection of data items of same data type. Arrays can only be declared.	A structure is a collection of data items of different data types. Structures can be declared and defined.	There is no keyword for arrays.	The keyword for structures is struct.	An array cannot have bit fields.	A structure may contain bit fields.	An array name represents the address of the starting element.	A structure name is known as tag. It is a Shorthand notation of the declaration.
<b>Arrays</b>	<b>Structures</b>										
An array is a collection of data items of same data type. Arrays can only be declared.	A structure is a collection of data items of different data types. Structures can be declared and defined.										
There is no keyword for arrays.	The keyword for structures is struct.										
An array cannot have bit fields.	A structure may contain bit fields.										
An array name represents the address of the starting element.	A structure name is known as tag. It is a Shorthand notation of the declaration.										
2	<p><b>Difference between structure and union.</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;"><b>Structure</b></th><th style="text-align: center; padding: 5px;"><b>Union</b></th></tr> </thead> <tbody> <tr> <td style="padding: 5px;">Every member has its own memory.</td><td style="padding: 5px;">All members use the same memory.</td></tr> <tr> <td style="padding: 5px;">The keyword used is struct.</td><td style="padding: 5px;">The keyword used is union.</td></tr> <tr> <td style="padding: 5px;">All members occupy separate memory location, hence different interpretations of the same memory location are not possible. Consumes more space compared to union.</td><td style="padding: 5px;">Different interpretations for the same memory location are possible. Conservation of memory is possible</td></tr> </tbody> </table>	<b>Structure</b>	<b>Union</b>	Every member has its own memory.	All members use the same memory.	The keyword used is struct.	The keyword used is union.	All members occupy separate memory location, hence different interpretations of the same memory location are not possible. Consumes more space compared to union.	Different interpretations for the same memory location are possible. Conservation of memory is possible		
<b>Structure</b>	<b>Union</b>										
Every member has its own memory.	All members use the same memory.										
The keyword used is struct.	The keyword used is union.										
All members occupy separate memory location, hence different interpretations of the same memory location are not possible. Consumes more space compared to union.	Different interpretations for the same memory location are possible. Conservation of memory is possible										
3	<p><b>Define Structure in C</b></p> <ul style="list-style-type: none"> <li>✓ C Structure is a collection of different data types which are grouped together and each element in a C structure is called member.</li> <li>✓ If you want to access structure members in C, structure variable should be declared. Many structure variables can be declared for same structure and memory will be allocated for</li> </ul>										

	<ul style="list-style-type: none"> <li>✓ each separately.</li> <li>✓ It is a best practice to initialize a structure to null while declaring, if we don't assign any values to structure members</li> </ul>
4	<p><b>What you meant by structuredefinition?</b></p> <ul style="list-style-type: none"> <li>✓ A structure type is usually defined near to the start of a file using a <code>typedef</code> statement.</li> <li>✓ <code>typedef</code> defines and names a new type, allowing its use throughout the program.</li> <li>✓ <code>typedefs</code> usually occur just after the <code>#define</code> and <code>#include</code> statements in a file.</li> <li>✓ Here is an example structure definition.</li> </ul> <pre>typedef struct { char name[64]; char course[128]; int age; int year; } student;</pre> <p>This defines a new type <code>student</code> variables of type <code>student</code> can be declared as follows.</p> <pre>student st_rec;</pre>
5	<p><b>List out the methods that are available with list object in C programming. BTL1</b></p> <ul style="list-style-type: none"> <li>✓ <code>index(object)</code></li> <li>✓ <code>count(object)</code></li> <li>✓ <code>pop()/pop(index)</code></li> <li>✓ <code>insert(index,object)</code></li> <li>✓ <code>extend(sequence)</code></li> <li>✓ <code>remove(object)</code></li> <li>✓ <code>reverse()</code></li> <li>✓ <code>sort()</code></li> <li>✓ <code>copy()</code></li> </ul>
6	<p><b>Show the membership operators used in list. BTL1</b></p> <p>Python's membership operators test for membership in a sequence, such as strings, lists or tuples. There are two membership operators.</p>

	<ul style="list-style-type: none"> <li>✓ In</li> <li>✓ not in</li> </ul>				
7	<p><b>What is meant by Union inC?</b></p> <ul style="list-style-type: none"> <li>✓ A <b>union</b> is a special data type available in C that enables you to store different data types in the same memory location.</li> <li>✓ You can define a union with many members, but only one member can contain a value at any given time.</li> <li>✓ Unions provide an efficient way of using the same memory location for multi-purpose.</li> </ul>				
8	<p><b>How to define a union inC.</b></p> <ul style="list-style-type: none"> <li>✓ To define a union, you must use the <b>union</b> statement in very similar was as you did while defining structure.</li> <li>✓ The union statement defines a new data type, with more than one member for your program.</li> <li>✓ The format of the union statement is as follows:</li> </ul> <pre><b>union</b> [union tag] {     member     definition;     member     definition;     ...     member definition; } [one or more <b>union</b> variables];</pre>				
9	<p><b>Classify the C accessing Elements in a tuples? BTL1</b></p> <ul style="list-style-type: none"> <li>✓ Indexing</li> <li>✓ Negative Indexing</li> <li>✓ Slicing</li> </ul>				
10	<p><b>Point out the methods used in tuples? BTL1</b></p> <table border="1"> <tr> <td><u>count(x)</u></td> <td>Return the number of items that is equal to <math>x</math></td> </tr> <tr> <td><u>index(x)</u></td> <td>Return index of first item that is equal to <math>x</math></td> </tr> </table>	<u>count(x)</u>	Return the number of items that is equal to $x$	<u>index(x)</u>	Return index of first item that is equal to $x$
<u>count(x)</u>	Return the number of items that is equal to $x$				
<u>index(x)</u>	Return index of first item that is equal to $x$				

11	<p><b>How a tuple is iterated? Explain with an example? BTL1</b></p> <p>Using a for loop we can iterate through each item in a tuple.</p> <p>Eg:</p> <pre>for name in     ('John','Kate'):         print("Hello",name)</pre> <p>output:</p> <p>Hello John Hello Kate</p>
12	<p><b>What are storageclasses?</b></p> <p>A storage class defines the scope (visibility) and life time of variables and/or functions within a C Program</p>
13	<p><b>Define dictionary with an example? BTL1</b></p> <p>A dictionary is an unordered set of key and value pair. It is one of the compound data types of python. A dictionary contains a collection of indices, which are called <b>keys</b>, and a collection of values. Each key is associated with a single value</p> <pre>Eg: data={ 100:'Ravi' ,101:'Vijay' ,102:'Rahul'} print (data)</pre> <p>Output:</p> <p>{ 100: 'Ravi', 101: 'Vijay', 102: 'Rahul'}</p>

	<b>What are the properties of dictionary keys? BTL1</b>
14	✓ More than one entry per key not allowed ✓ Keys must be immutable
15	<b>Can you use the addition assignment operator, +=, with two lists. What is the result? BTL1</b> 'pythonic' way to do list concatenation
16	<p><b>Perform the bubble sort on the elements 23,78,45,8,32,56 BTL1</b></p> <pre>def bubbleSort(alist):     for passnum in range(len(alist)-1,0,-1):         for i in range(passnum):             if alist[i]&gt;alist[i+1]:                 temp = alist[i]                 alist[i] = alist[i+1]                 alist[i+1] = temp      alist = [54,26,93,17,77,31,44,55,20]     bubbleSort(alist)     print(alist)     output:     [14, 21, 27, 41, 43, 45, 46, 57, 70]</pre>
17	<p><b>What is empty? list how its created? BTL1</b></p> <p><b>The which has no element is called empty list.</b></p> <p><b>L1=[]</b></p>
18	<p><b>What is list mutability? BTL1</b></p> <p>List items can be changed using its index values it is called list mutability</p>
19	<p><b>What is list cloning? BTL1</b></p> <p>List cloning is a process of copying data of one list to another list. There are two types of cloning Deep copy and shallow copy</p>
20	<p><b>What is list aliasing?</b></p> <p>In list aliasing, items of one list will be copied to other list. Change in one list will affect the other</p>
21	<p><b>Describe list comprehension.</b></p> <pre>h_letters = [ letter for letter in 'human' ] print( h_letters)</pre>
22	<p><b>Print list items in reverse</b></p> <pre>h_letters = "Welcome" print(h_letters.reverse())</pre>
23	<p><b>What is the use of copy method in dictionary?</b></p> <p>Creates a copy of dictionary in another name</p>

	<pre>original = {1:'one', 2:'two'} new = original.copy() print('Original: ', original) print('New: ', new)</pre>
24	<p><b>How to delete or remove elements from a dictionary?</b></p> <pre>squares = {1:1, 2:4, 3:9, 4:16, 5:25} # Output: 16 print(squares.pop(4))</pre>
25	<p><b>Difference in Using copy() method, and = Operator to Copy Dictionaries</b></p> <p>Using =,Here, when the new dictionary is cleared, the original dictionary is also cleared    Using copy(), Here, when the new dictionary is cleared, the original dictionary remains unchanged</p>
	<b>PART * B</b>

## Arrays of Structure

1

- 'C" language permits to declare an array of structure variable.
- C does not limit a programmer to storing simple data types inside an array.
- User defined structures too can be elements of an array.
- Example:

```
struct date birthdays[10];
```

- This defines an array called *birthdays* that has 10 elements.
- Each element inside the array will be of type struct *date*.
- Referencing an element in the array is quite simple.

```
birthdays[1].month = 09;
birthdays[1].day = 20;
birthdays[1].year = 1965;
```

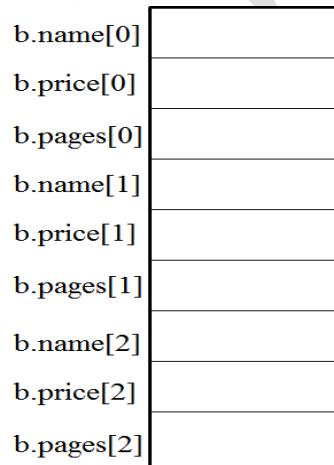
- Initialisation of structure arrays is similar to initialization of multidimensional arrays.
- For Example:

```
static struct birthdays[10] = { {9,30,1965},{9,26,1971}};
```

- will initialise the first two elements of the *birthdays* array.

✓ **Example:**

```
struct book
{
    char name[10];
    int price;
    int pages;
};
```



**Program 1:**

**/\* Program to store 3 book records in one structure / using array of structure \*/**

```
#include<stdio.h>
#include<conio.h>
struct book
{
    char name[10];
    int price;
    int pages;
};
struct book b[3];
void main()
{
    int i;
    clrscr();
    for(i=1;i<=3;i++)
    {
        printf("Enter book name,price and pages:\n");
        scanf("%s%d%d",&b[i].name,&b[i].price,&b[i].pages);
    }
    printf(" The Records of book are as follows:\n");

    for(i=1;i<=3;i++)
    printf("\n%s\t%d\t%d",b[i].name,b[i].price,b[i].pages);
    getch();
}
```

**Output:**

Enter book name, price and pages:  
English 165 200

Enter book name, price and pages:  
Maths 300 450

Enter book name, price and pages:  
Physics 250 370

The Records of book are as follows:

English	165	200
Maths	300	450
Physics	250	370

(2M)

**Creating the List ,Accessing values in the Lists ,Updating the Lists, Deleting the list Elements (16 M) (BTL2)**

**Answer:Page:4.10-4.13-DR.V.Ramesh**

- ✓ CreatingtheList

(3M)

<list\_variable>= [<value 1>, <value 2>,...<value n>]

- ✓ Accessing valuesin theLists

(5M)

- ✓ UpdatingtheLists

(4M)

- ✓ DeletingthelistElements

(4M)

del <list\_name>[ starting index: ending index]

## **Pointer and Structures**

C structure can be accessed in 2 ways in a C program. They are,

1. Using normal structure variable
2. Using pointer variable

Dot(.) operator is used to access the data using normal structure variable and arrow (->) is used to access the data using pointer variable. You have learnt how to access structure data using normal variable in C – Structure topic. So, we are showing here how to access structure data using pointer variable in below C program.

Consider the structure:

```
4 struct student
{
    charname[20];
    int age;
    int rollno;
} ;
struct student s={"Kumar",21,1001};
struct student *ptr=&student;
```

### **We can access members of the structure by any of the following**

1. Using structure variable s.age ,s.rollno ,s.name
- 2.Using pointer variable ptr->age,ptr->rollno,ptr->name

### **Pointer variable can be assigned address in two ways:**

1. Referencing pointer to another structure variable (storing address of a structure variable in a pointer)
2. Using dynamic memory allocation (allocating memory for a structure dynamically and store the address in a pointer variable)

### Example program for C structure using pointer (8M)BTL1

In this program, “record1” is normal structure variable and “ptr” is pointer structure variable. As we know, Dot(.) operator is used to access the data using normal structure variable and arrow(->) is used to access data using pointer variable.

```
#include <stdio.h>
#include <string.h>

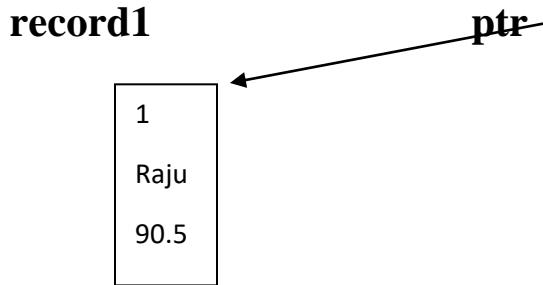
struct student
{
    int id;
    char name[30];
    float percentage;
};

int main()
{
    int i;
    struct student record1 = {1, "Raju", 90.5};
    struct student *ptr;

    ptr = &record1;

    printf("Records of STUDENT1: \n");
    printf(" Id is: %d \n", ptr->id);
    printf(" Name is: %s \n", ptr->name);
    printf(" Percentage is: %f \n\n", ptr->percentage);

    return 0;
}
```



(Assume address of record1 is 5050)

Output:

**Records of STUDENT1:**

Id is: 1

Name is: Raju

Percentage is: 90.500000

**Illustrate List Comprehension with suitable examples(16M) (BTL2)**

**Answer:Page:4.22-DR.V.Ramesh**

Definition

(5M)

5 Python includes a more advanced and powerful operation known as a list comprehension expression.  
List comprehensions are coded in square brackets and are composed of an expression and a looping construct that share a variable name

The output of list comprehension is List

Example

(8M)

Explanation

(3M)

**Dynamic Memory Allocation**

6 The process of allocating memory during program execution is called dynamic memory allocation.

(4M)

(2M)

(2M)

C language offers 4 dynamic memory allocation functions. They are,

1. `malloc()`
2. `calloc()`
3. `realloc()`
4. `free()`
- 5.

(2M)

(2M)

(2M)

These library functions are defined under `<stdlib.h>`

Function	Use of Function
<code>malloc()</code>	Allocates requested size of bytes and returns a pointer first byte of allocated space
<code>calloc()</code>	Allocates space for an array elements, initializes to zero and then returns a pointer to memory
<code>free()</code>	deallocate the previously allocated space
<code>realloc()</code>	Change the size of previously allocated space

`malloc()`

The name malloc stands for "memory allocation".

The function `malloc()` reserves a block of memory of specified size and return a pointer of type `void` which can be casted into pointer of any form.(returns the starting address of

reserved memory)

**Syntax of malloc()**

`ptr = (cast-type*) malloc(byte-size)`

Here, `ptr` is pointer of cast-type. The `malloc()` function returns a pointer to an area of memory with size of byte size. If the space is insufficient, allocation fails and returns NULL pointer.

`ptr = (int*) malloc(100 * sizeof(int));`

This statement will allocate either 200 or 400 according to size of int 2 or 4 bytes respectively and the pointer points to the address of first byte of memory

**calloc( )**

The name calloc stands for "contiguous allocation".

8

The only difference between malloc() and calloc() is that, malloc() allocates single block of memory whereas calloc() allocates multiple blocks of memory each of same size and sets all bytes to zero.

(4M)  
(4M)  
(4M)  
(1M)  
(3M)

**Syntax of calloc()**

`ptr = (cast-type*)calloc(n, element-size);`

This statement will allocate contiguous space in memory for an array of `n` elements. For example:

`ptr = (float*) calloc(25, sizeof(float));`

This statement allocates contiguous space in memory for an array of 25 elements each of size of float, i

.e, 4 bytes.

**free()**

Dynamically allocated memory created with either calloc() or malloc() doesn't get freed on its own. You must explicitly use free() to release the space.

***syntax of free()***

`free(ptr);`

This statement frees the space allocated in the memory pointed by `ptr`.

	<b>Create a python program to perform selection sort on the elements (16M) (BTL2)</b> <b>Answer:Page:4.38-DR.V.Ramesh</b>	
9	<pre>def selectionSort(x):     for i in range(len(x)-1,0,-1):         pMax=0         for j in range(1,i+1):             if x[j]&gt;x[pMax]:                 pMax = j         tmp = x[i]         x[i] = x[pMax]</pre>	(10M)
	<pre>x[pMax] = tmp x = [98,26,52,21,67,39,48,99,11] selectionSort(x) print(x)</pre> <p>Output Explanation</p>	(3M) (3M)
10	<b>Create a python program to perform insertion sort (16M)(BTL2)</b> <b>Answer:Page:4.36-DR.V.Ramesh</b>	
	<pre>DefinsertionSort(x):     for index in range(1,len(x)):         currentvalue = x[index]         position = index         while position&gt;0 and x[position-1]&gt;currentvalue:             x[position]=x[position-1]             position = position-1         x[position]=currentvalue x = [98,26,52,21,67,39,48,99,11] insertionSort(x) print(x)</pre> <p>Output Programexplanation</p>	(10M) (3M) (3M)

11 Create a C program to perform Merge Sort (16M) (BTL2)

**Answer:Page:4.44-DR.V.Ramesh**

```
defmergeSort(x):
    print("Splitting ",x)
    if len(x)>1
        mid = len(x)//2
        lefthalf = x[:mid]
        righthalf = x[mid:]
        mergeSort(lefthalf)
        mergeSort(righthalf)
        i=0
        j=0
        k=0
        while i <len(lefthalf) and j <len(righthalf):
            if lefthalf[i] <righthalf[j]:
                x[k]=lefthalf[i]
                i=i+1
            else:
                x[k]=righthalf[j]
                j=j+1
            k=k+1
```

```
k=k+1
while i <len(lefthalf):
    x[k]=lefthalf[i]
    i=i+1
    k=k+1
while j <len(righthalf):
    x[k]=righthalf[j]
    j=j+1
    k=k+1
print("Merging ",alist)
```

Output

Programexplanation

(3M)

(3M)

## UNIT-VFILE PROCESSING

Files – Types of file processing: Sequential access, Random access – Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files – Command line arguments

<b>Q.No</b>	<b>PART * A</b>
1	<b>Why files are needed?</b> <ul style="list-style-type: none"> <li>✓ When a program is terminated, the entire data is lost. Storing in a file will preserve your data even if the program terminates.</li> </ul>
2	<b>What are the types of Files?</b> <p>When dealing with files, there are two types of files you should know about:</p> <ol style="list-style-type: none"> <li>1. Text files.</li> <li>2. Binary files.</li> </ol>
3	<b>Enlist the FileOperations.</b> <p>In C, you can perform four major operations on the file, either text or binary:</p> <ol style="list-style-type: none"> <li>1. Creating a newfile</li> <li>2. Opening an existingfile</li> <li>3. Closing afile</li> <li>4. Reading from and writing information to afile</li> </ol>
4	<b>Define module. BTL1</b> <ul style="list-style-type: none"> <li>✓ A module is a file containing Python definitions and statements.</li> <li>✓ The file name is the module name with the suffix .py appended.</li> <li>✓ Within a module, the module's name (as a string) is available as the value of the global variable <code>_name_</code>.</li> <li>✓ Modules are used to categorize code in python into smaller part.</li> <li>✓ A module is a Python object with arbitrarily named attributes that you can bind and reference. Simply, a module is a file consisting of Python code. A module can define functions, classes and variables. A module can also include runnable code.</li> </ul>
5	<b>What are the advantages for using module? BTL2</b> <ul style="list-style-type: none"> <li>✓ Reusability</li> <li>✓ Categorization</li> </ul>
7	<b>How to close afile?</b> <ul style="list-style-type: none"> <li>✓ The file (both text and binary) should be closed after reading/writing. Closing a file is performed using library function <code>fclose()</code>. <code>fclose(fp);</code> //fp is the file pointer associated with file to be closed.</li> </ul>

8	<p><b>Reading and writing to a textfile</b></p> <ul style="list-style-type: none"> <li>✓ For reading and writing to a text file, we use the functions fprintf() and fscanf().</li> <li>✓ They are just the file versions of printf() and scanf(). The only difference is that, fprintf and fscanf expects a pointer to the structure FILE.</li> </ul>
9	<p><b>What are two main ways a file can be organized?</b></p> <ul style="list-style-type: none"> <li>✓ <b>Sequential Access</b> — The data are placed in the file in a sequence like beads on a string. Data are processed in sequence, one after another. To reach a particular item of data, all the data that precedes it first must be read.</li> <li>✓ <b>Random Access</b> — The data are placed into the file by going directly to the location in the file assigned to each data item. Data are processed in any order.</li> </ul> <p>A particular item of data can be reached by going directly to it, without looking at any other data.</p>
10	<p><b>What are the advantages of files?</b> BTL2</p> <ul style="list-style-type: none"> <li>✓ When the data is stored in a file, it is stored permanently.</li> <li>✓ The files in the data can be utilized as and when required.</li> <li>✓ It is possible to update the data.</li> <li>✓ Files are highly useful to store huge amount of data.</li> </ul>
11	<p><b>Write the syntax for write () method and read () method?</b> BTL1</p> <pre>fileObject.write(string) fileObject.read([count])</pre>
12	<p><b>Define syntax errors.</b> BTL1</p> <p>Syntax errors, also known as parsing errors, are perhaps the most common kind of complaint you get while you are still learning Python.</p> <pre>&gt;&gt;&gt; while True print ('Hello Python') SyntaxError: invalid syntax &gt;&gt;&gt;</pre>
13	<p><b>What isfile?</b></p> <ul style="list-style-type: none"> <li>✓ A file is a semi-permanent, named collection of data. A File is usually stored on magnetic media, such as a hard disk or magnetic tape.</li> <li>✓ Semi-permanent means that data saved in files stays safe until it is deleted or modified.</li> <li>✓ Named means that a particular collection of data on a disk has a name, like mydata.dat and access to the collection is done .</li> </ul>
14	<p><b>Define package.</b> BTL1</p> <p>A package is a directory that contains modules. Having a directory of modules allows us to have modules contained within other modules. This allows us to use qualified module names, clarifying the organization of our software</p>

15	<p><b>What is Errors?</b> BTL3</p> <p>In Python, there are two kinds of errors: syntax errors and exceptions. This post will describe what those errors are. Upcoming posts will show how we can handle those errors</p>
16	<p><b>What is syntax error?</b> BTL3</p> <p>Let's start with syntax errors, (also known as parsing errors).</p> <p>The parser repeats the offending line and displays an 'arrow' pointing at the earliest point in the line where the error was detected</p> <pre>&gt;&gt;&gt; while True print 'Hello world' File       "", line 1, in ?</pre>
	<p>while True print 'Hello world'</p>
17	<p><b>What is exception?</b> BTL3</p> <p>Even if a statement or expression is syntactically correct, it may cause an error when an attempt is made to execute it. Errors detected during execution are called exceptions</p> <p>Example of an exception error.</p> <pre>&gt;&gt;&gt; 10 * (1/0)</pre>
18	<p><b>Define Namespaces.</b> BTL3</p> <p>Variables are names or identifiers that map to objects. A namespace is a dictionary of variable names/keys and their corresponding objects values. Each function has its own local namespace.</p>
19	<p><b>Mention the attributes related to file object.</b> BTL3</p> <ul style="list-style-type: none"> <li>✓ File.closed</li> <li>✓ file.mode</li> <li>✓ file.name</li> <li>✓ file.softspace</li> </ul>
21	<p><b>What is Try and Except?</b> BTL3</p> <p>If an error is encountered, a try block code execution is stopped and transferred down to the except block.</p> <p>In addition to using an except block after the try block, you can also use the finally block. The code in the finally block will be executed regardless of whether an exception occurs.</p>

<b>PART * B</b>		
1	<b>Write a Python program to demonstrate the file I/O operations(16M) BTL4</b> <b>Answer:Page:5.12-DR.V.Ramesh</b> ✓ Introduction – storageof bits □ Program ✓ Explanation - open() function – close () funation- working of file need to beexplained	(4M) (6M) (6M)
2	<b>Discuss with suitable examples (i) Close a File. (ii) writing file (Jan 2018) (16M) BTL4</b> <b>Answer:Page:5.5-DR.V.Ramesh</b> (i) Close a File. □ Syntax -close() □ Program (ii)Writing to a File. Syntax -write() ✓ Program	(4M) (4M) (4M) (4M)
3	<b>i)Write a program to catch a Divide by zero exception. Add a finally block too. ii)Write a function to print the hash of any given file . (16M) BTL5</b> <b>Answer:Page:5.41-DR.V.Ramesh</b>  <b><u>Program</u></b> import random try: ri = random.randint(0, 2) if ri == 0: infinity = 1/0	(8M)

	<pre> elif ri == 1:     raise ValueError("Message") #raise ValueError, "Message" # Deprecated elif ri == 2:     raise ValueError # Without message except ZeroDivisionError:     pass except ValueError as valerr: #except ValueError, valerr: # Deprecated? print     valerr     raise # Raises the exception just caught except: # Any other exception     pass finally: # Optional pass     # Clean up class CustomValueError(ValueError): pass # Custom exception try:     raise CustomValueError     raise TypeError except (ValueError, TypeError): # Value error catches custom, a derived class, as well pass </pre> <p>ii) Program to print the hash of any given file in python (8M)</p>
4	<p><b>(i) Describe in detail about Exception with Arguments (ii) Describe in detail about user – defined Exceptions (Jan 2018) (16M) BTL1</b></p> <p><b>Answer:</b> Page:5.43-6-DR.V.Ramesh, Page:5.34-DR.V.Ramesh</p> <p><b>(i) Exception with Arguments</b></p> <p>Syntax (4M) Example (4M)</p> <p><b>(ii) Describe in detail about user – defined Exceptions.</b></p> <p>AboutException (4M); Example (4M)</p>
5	<p><b>(i) Explain with example of closing a file (Jan 2018) (ii) Discover syntax for reading from a file. (6M) BTL3</b></p> <p><b>Answer:</b> Page:5.12-DR.V.Ramesh</p> <ul style="list-style-type: none"> <li>✓ Syntax (4M)</li> <li>✓ Example (4M)</li> </ul> <p><b>(ii) Discover syntax for reading from a file.</b></p> <ul style="list-style-type: none"> <li>✓ file.read(). (1M)</li> <li>✓ file.read(5) (2M)</li> <li>✓ file.readline() (1M)</li> </ul>

	<ul style="list-style-type: none"> <li>✓ file.readline(3) (2M)</li> <li>✓ file.readlines() (2M)</li> </ul>
6	<p><b>What is command line arguments? Explain with example. BTL2</b></p> <h2><b>Command Line Arguments(2017)</b></h2>
	<p>Command line arguments are values passed in during execution of a program. These values are passed after the file name.</p> <p>Sys.argv is the package used for accessing command line arguments. Sys.argv[0] will be file name.</p> <p><b>Cmdline.py</b></p> <pre>import sys  print sys.argv[0] print  sys.argv[1] print  sys.argv[2] print  sys.argv[3] print  len(sys.argv)</pre> <p><b>Output</b></p> <pre>&gt;&gt;&gt;python Cmdline.py good morning hello hi           0    1    2    3    4  cmdline.py good morning hello</pre>

**BE8255 BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING****LTPC3003****OBJECTIVES:**

- To understand the fundamentals of electronic circuit constructions.
- To learn the fundamental laws, theorems of electrical circuits and also to analyze them
- To study the basic principles of electrical machines and their performance
- To study the different energy sources, protective devices and their field applications
- To understand the principles and operation of measuring instruments and transducers

**UNIT I ELECTRICAL CIRCUITS ANALYSIS**

9

Ohms Law, Kirchhoff's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems - Thevenin's theorem, Norton theorem, maximum power transfer theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.

**UNIT II ELECTRICAL MACHINES**

9

DC and AC ROTATING MACHINES: Types, Construction, principle, Emf and torque equation, application Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers-Introduction- types and construction, working principle of Ideal transformer-Emf equation- All day efficiency calculation.

**UNIT III UTILIZATION OF ELECTRICAL POWER**

9

Renewable energy sources-wind and solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Domestic refrigerator and air conditioner-Electric circuit, construction and working principle. Batteries-NiCd, Pb Acid and Li ion-Charge and Discharge Characteristics. Protection-need for earthing, fuses and circuit breakers. Energy Tariff calculation for domestic loads.

**UNIT IV ELECTRONIC CIRCUITS**

9

PN Junction-VI Characteristics of Diode, Zener diode, Transistors configurations - amplifiers. Op amps- Amplifiers, oscillator, rectifiers, differentiator, integrator, ADC, DAC. Multi vibrator using 555 Timer IC . Voltage regulator IC using LM 723,LM 317.

**UNIT V ELECTRICAL MEASUREMENT**

9

Characteristic of measurement-errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Energy meter and watt meter. Transducers- classification-thermo electric, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope-CRO.

**TOTAL: 45****PERIODS OUTCOMES: Upon completion of the course, the students will be able to:**

- Discuss the essentials of electric circuits and analysis.
- Discuss the basic operation of electric machines and transformers
- Introduction of renewable sources and common domestic loads.
- Introduction to measurement and metering for electric circuits.

**TEXT BOOKS:**

1. D.P.Kothari and I.J.Nagarath, Basic Electrical and Electronics Engineering, McGrawHill, 2016, Third Edition.
2. M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.

**REFERENCES:**

1. S.B. Lal Seksena and Kaustuv Dasgupta, Fundamentals of Electrical Engineering, Cambridge, 2016
2. B.L Theraja, Fundamentals of Electrical Engineering and Electronics. Chand & Co, 2008.
3. S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015
4. John Bird, —Electrical and Electronic Principles and Technology, Fourth Edition, Elsevier, 2010.
5. Mittal, Basic Electrical Engineering, 2nd Edition, Tata McGraw-Hill Edition, 2016.

6. C.L.Wadhwa,—Generation, Distribution and Utilisation of Electrical Energy, New Age internationalpvt.ltd.,2003.

**SubjectCode:BE8255****Year/Semester: II/02****Subject Name:** BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING**Subject Handler:** Mr.A.Antony charles**UNIT I ELECTRICAL CIRCUITS ANALYSIS**

**Ohms Law, Kirchhoff 's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems - Thevenins theorem, Norton theorem, maximum power transfer theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.**

**Part\*A**

<b>Q.No</b>	<b>Question</b>
1.	<p><b>State Ohm's law.</b> BTL1</p> <p>Ohm's law states that the current flowing in a conductor is directly proportional to the potential between two ends of a conductor. i.e., <math>I \propto V</math>, <math>V = IR</math>.</p>
2.	<p><b>State the Limitation of Ohm's law. (APR/MAY 2019)</b> BTL1</p> <ul style="list-style-type: none"> <li>➤ Ohm's law doesn't apply to all non-metallic conductors.</li> <li>➤ Doesn't apply to nonlinear devices like Zener diode, Voltage regulator, tubes etc.,</li> <li>➤ It is not applicable for the metallic conductors which changes with temperature.</li> </ul>
3.	<p><b>Define i) charge ii) electric current iii) power iv) network&amp; v) circuit. . (APR/MAY 2018)</b> BTL1</p> <p><b>Charge:</b> Charge is an electrical property of the atomic particles of which matter consists, measured in coulombs(C).</p> <p><b>Electric current:</b> is the time rate of change of charge, measured in amperes (A). <math>i = dq/dt</math></p> <p>A direct current (DC) is a current that remains constant with time. An alternating current (AC) is a current that varies sinusoidally with time.</p> <p><b>Power:</b> is the time rate of expending or absorbing energy, measured in watts (w). <math>p = \frac{dw}{dt}</math></p> <p>p- Power in watts(w); E- energy in joules (J); t - time in seconds (S);(or) <math>p = v i</math>, v - Voltage in volts(V); i - current in amperes(A).</p> <p><b>Network:</b> The inter connection of two or more simple circuit elements forms an electrical network.</p> <p><b>Circuit:</b> If the network contains at least one closed path, it is an electric circuit.</p>

4. **State Kirchoff's Current law and Kirchoff's Voltage law. BTL1**

**KCL** (Kirchoff's Current Law) states that the algebraic sum of currents entering a node is zero (or).

	<p>The sum of the currents entering a node is equal to the sum of the currents leaving the node.</p> <p><b>KVL</b> (Kirchoff's Voltage Law) states that the algebraic sum of all voltages around a closed path is zero. (Or) Sum of voltage drop = Sum of voltage rise.</p>
5.	<p><b>What do you meant by series and parallel circuit? BTL1</b></p> <p>When circuit elements like resistors are connected in series, such that the same current passes through all of them, then they are said to be in series. When circuit elements are connected across one another such that the same voltage is applied to each, then they are said to be in parallel.</p>
6.	<p><b>Define: Node (OR) Junction. (APR/MAY 2019) BTL1</b></p> <p>A Node is a point in the network where two or more circuit elements are connected.</p>
7.	<p><b>Write down the expression of equivalent resistance for 'n' - number of resistors in parallel connection. (APR/MAY 2018) BTL1</b></p> <p>For 'n' resistors connected in parallel, the equivalent resistance is given by,</p> $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \frac{1}{R_n}$
8.	<p><b>Write down the expression of equivalent resistance for 'n' – number of resistors in series connection. BTL1</b></p> <p>For 'n' resistors connected in series, the equivalent resistance is given by,</p> $R_{eq} = R_1 + R_2 + R_3 + \dots + R_n$
9.	<p><b>Apply KVL and find the current in the circuit from 40V. BTL2</b></p> <p>By applying KVL, <math>40 - 8I + 100 - 2I - 30I = 0</math>, Ans: <math>I = 5A</math></p>
10.	<p><b>Distinguish between a Loop &amp; Mesh of a circuit. (APR/MAY 2018) BTL3</b></p> <p>The closed path of a network is called a Loop. An elementary form of a loop which cannot be further divided is called a mesh. In other words, Mesh is a closed path that does not contain any other loop within it.</p>
11.	<p><b>Calculate the equivalent resistance between the terminals "a" and "b" in Fig.1. BTL2</b></p>

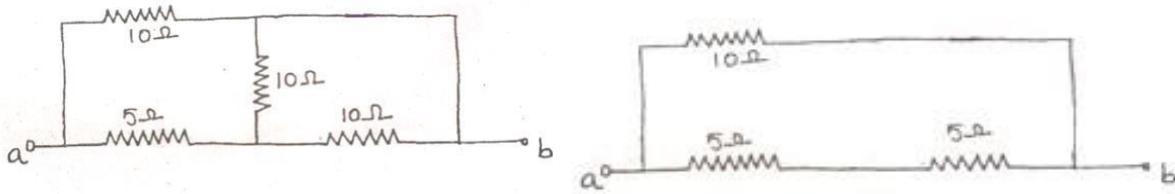


Fig. 1

Resistance between terminals 'a' and 'b' =  $(10 \times 10) / (10 + 10) = 5\Omega$

12. The resistance of two wires is  $25\Omega$  when connected in series and  $6\Omega$  when connected in parallel. Calculate the resistance of each wire. BTL2

$$R_1 + R_2 = 25\Omega, R_2 = 25 - R_1 \quad \dots \quad (1)$$

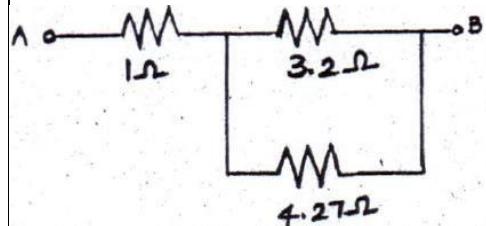
$$R_1 R_2 / (R_1 + R_2) = 6\Omega, \dots \quad (2)$$

Substitute eqn(1) in eqn (2),

$$R^2 - 25R + 150 = 0$$

$$R_1 = 10\Omega, R_2 = 15\Omega \text{ (or)} R_1 = 15\Omega, R_2 = 10\Omega$$

13. Find the equivalent resistance of the circuit shown in fig. (APR/MAY 2019) BTL3



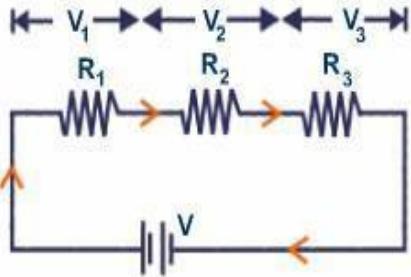
$$\text{Equivalent resistance} = 1 + \frac{2 \times 27}{2+27}\Omega = 2.86\Omega$$

14. State division of current rule for a two-branch parallel network. BTL1

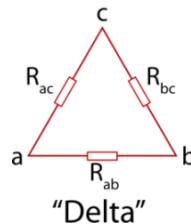
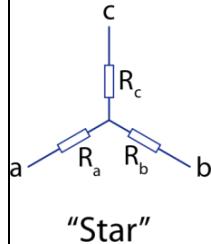
$R_1$  and  $R_2$  are connected in parallel, Let  $I$  be the total current,  $I_1$  be the current through  $R_1$ ,  $I_2$  be the current through  $R_2$ . Then  $I_1 = I * R_2 / (R_1 + R_2)$ ;  $I_2 = I * R_1 / (R_1 + R_2)$

15. State division of voltage rule for a circuit with three resistors in series. BTL1

$R_1$ ,  $R_2$  and  $R_3$  are connected in series, Let  $V$  be the total voltage,  $V_1$  be the voltage across  $R_1$ ,  $V_2$  be the voltage across  $R_2$ ,  $V_3$  be the voltage across  $R_3$ . Then,  $V_1 = V * R_1 / (R_1 + R_2 + R_3)$ ,  $V_2 = V * R_2 / (R_1 + R_2 + R_3)$  and  $V_3 = V * R_3 / (R_1 + R_2 + R_3)$



16. Write down the formulae for converting Star to Delta. (APR/MAY 2018) BTL2



$$R_{ab} = (R_a R_b + R_b R_c + R_c R_a) / R_c;$$

$$R_{bc} = (R_a R_b + R_b R_c + R_c R_a) / R_a;$$

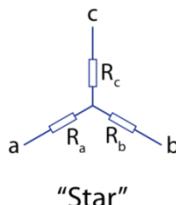
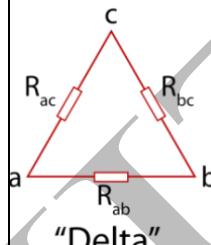
$$R_{ca} = (R_a R_b + R_b R_c + R_c R_a) / R_b.$$

17. Write down the formulae for converting Delta to Star. BTL2

$$R_a = (R_{ac} R_{ab}) / (R_{ab} + R_{bc} + R_{ca});$$

$$R_b = (R_{ab} R_{bc}) / (R_{ab} + R_{bc} + R_{ca});$$

$$R_c = (R_{ac} R_{bc}) / (R_{ab} + R_{bc} + R_{ca})$$



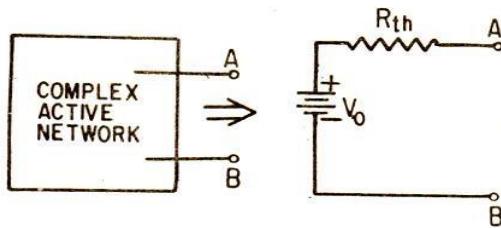
18. State Superposition theorem. BTL1

The superposition theorem states that in any linear bilateral network containing two or more sources, the response in any element is equal to algebraic sum of the responses caused by individual sources acting alone, while the other sources are non-operative; that is, while considering the effect of individual sources, other ideal voltage sources and ideal current sources in the network are replaced by short circuit and open circuit across their terminals.

**19. State Thevenin's theorem. BTL1**

Thevenin's theorem states that any circuit having a number of voltage sources, resistances and open output terminals can be replaced by a simple equivalent circuit consisting of a single voltage source ( $V_{th}$ ) in series with a resistance (impedance)  $R_{th}(Z_{th})$ .

Where  $V_{th}$  is equal to the open circuit voltage across the two terminals,  $R_{th}$  is equal to the equivalent resistance measured between the terminals with all energy sources are replaced by their internal resistance.



**20. What is the limitation of superposition theorem? BTL1**

Super position theorem can be applied for finding the current through or voltage across a particular element in a linear bilateral circuit containing more than two sources. But this theorem cannot be used for the calculation of the power.

**21. State reciprocity theorem. BTL1**

According to this theorem, in a linear, bilateral network if we apply some input to a circuit which consists of resistors, inductors, capacitors and transformers, the ratio of response in any element to the input is constant even when the position of input and output are interchanged. This is called the Reciprocity Theorem.

**22. State Maximum power transfer theorem. (or) What is the condition for maximum power transfer in DC and AC circuits. BTL1**

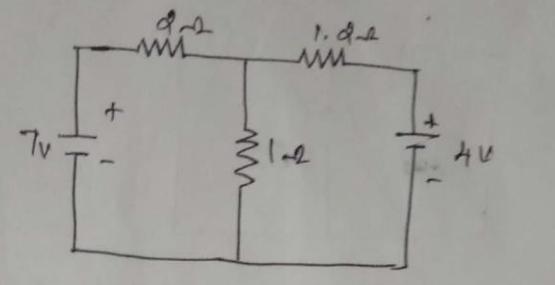
The maximum power transfer theorem states that, to obtain maximum external power from a source with a **finite** internal resistance, the resistance of the load must equal the resistance of the source as viewed from its **output terminals**. According to maximum power transfer theorem, maximum power transfer occurs when  $R_L = R_{TH}$ , that is, when the load resistance is equal to the thevenin resistance.

**23. State Norton's theorem. BTL1**

Norton's theorem states that any circuit with voltage sources, resistances (impedances) and open output terminals can be replaced by a single current source  $I_{sc}$  in parallel with single resistance  $R_{th}(Z_{th})$ . Where  $I_{sc}$  is equal to the current passing through the short circuit output terminals

$R_{th}$  is equal to the resistance seen into the output terminals with all energy sources are replaced by their internal resistance.

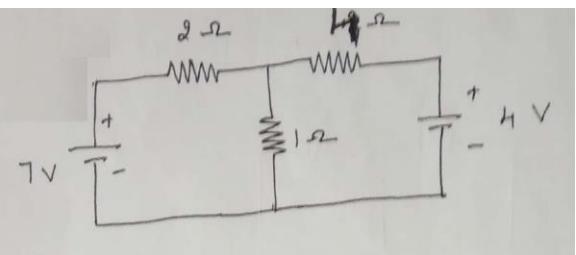
24.	<p>Two resistors of <math>4\Omega</math> and <math>6\Omega</math> are connected in parallel. If the total current is 30A. Find the current through each resistor shown in below fig. BTL3</p> <p>Current through <math>4\Omega</math>, <math>I_4 = I_T \times \frac{R_6}{R_4 + R_6} = 30 \times \frac{6}{6+4} = 18</math> A      Current through <math>6\Omega</math>, <math>I_6 = I_T \times \frac{R_4}{R_4 + R_6} = 30 \times \frac{4}{6+4} = 12</math> A</p>
25.	<p><b>What is meant by Current?</b> BTL1</p> <p>The flow of free electron in a conductor is called current. Unit is ampere (A).  <math>I = Q/t</math></p>
26.	<p><b>What is meant by charge?</b> (APR/MAY 2019) BTL1</p> <p>Charge is an electrical property of the atomic particles which matter consists. The charge of an electron is so small. Charge in motion represents current. The unit of charge is coulomb.</p>
27.	<p><b>Define line currents and phase currents.</b> BTL1</p> <p>The currents flowing in the lines are called as line currents. The currents flowing through phase are called phase currents.</p>
28.	<p><b>Give the phase value &amp; Line value of a star connected system.</b> BTL1</p> <p>Line voltage: <math>V_L = 3V_{ph}</math></p> <p>Phase voltage: <math>V_{ph} = V_L/3</math></p>

29.	<b>What is meant by Real power? BTL1</b>  Real power means the useful power transfer from source to load. Unit is watts.
30.	<b>What is meant by apparent power? BTL1</b>  Apparent power is the product of voltage and current and it is not true power. Unit is VA
31.	<b>What is reactive power? BTL1</b>  If we consider the circuit as purely inductive the output power is reactive power. Its unit is VAR
	<b>PART B</b>
<b>Q.No</b>	<b>Question</b>
1.	<b>Using Thevenin's theorem find the current flowing through the resistance <math>1\Omega</math>. (13M)</b> (APR/MAY 2019)BTL2  

**Answer: Page 7.4 - Dr. C. Ramesh Babu Durai**

- $V_{th} = 5.12V$
- $R_{th} = 0.75\Omega$
- $I_L = V_{th}/R_{th} + R_L$
- $I_L = 2.98A$

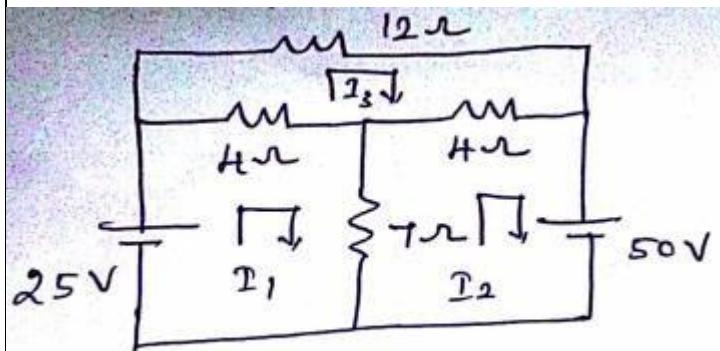
2. Using Thevenin's theorem find the current flowing through the resistance  $1\Omega$ . (13M) BTL2



	<p><b>Answer: Page 7.4 - Dr. C. Ramesh BabuDurai</b></p> <ul style="list-style-type: none"> <li>➤ <math>V_{th} = 6V</math></li> <li>➤ <math>R_{th} = 1.33 \Omega</math></li> <li>➤ <math>I_L = V_{th}/R_{th} + R_L</math></li> <li>➤ <math>I_L = 2.575A</math></li> </ul>
3.	<p><b>Obtain Norton's equivalent current at the terminal A &amp; B. (13M) BTL3</b></p> <p>Answer: Page 7.4 - Dr. C. Ramesh BabuDurai</p> <ul style="list-style-type: none"> <li>➤ <math>\Delta = 16.5</math></li> <li>➤ <math>\Delta_1 = 29.75</math></li> <li>➤ <math>I_{sc} = I_1 = 1.77A</math></li> <li>➤ <math>R_{th} = 6.27\Omega</math></li> <li>➤ <math>I_L = I_{sc} * R_{th} / R_{th} + R_L</math></li> <li>➤ <math>I_L = 1.5 A</math></li> </ul>

4.

Calculate current through  $7\Omega$  resistor by using mesh analysis. (APR/MAY 2019) (13M) BTL2



Answer: Page 7.4 - Dr. C. Ramesh Babu Durai

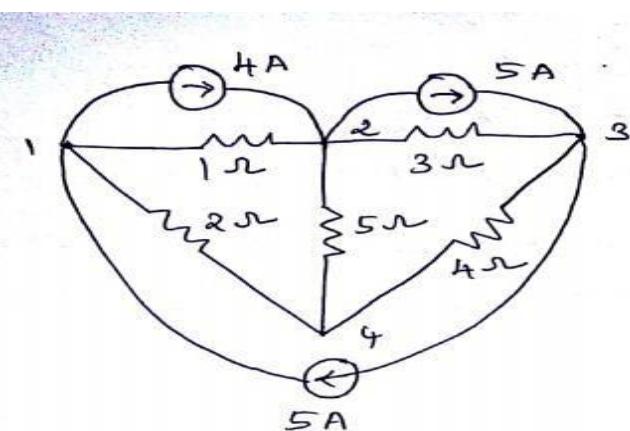
➤  $\Delta=3048$

	<ul style="list-style-type: none"> <li>➤ <math>I_1 = 1.3A</math></li> <li>➤ <math>I_2 = 2.06A</math></li> <li>➤ Current through 7-ohm resistor =-0.76A</li> </ul>
5.	<p><b>Calculate power consumed by 6 ohm resistor by using super position theorem. (13M)(APR/MAY 2018)BTL2</b></p> <p><b>Answer: Page 7.4 - Dr. C. Ramesh Babu Durai</b></p> <ul style="list-style-type: none"> <li>➤ Total current by first source =1.2A</li> <li>➤ <math>I_1 = 0.96A</math></li> <li>➤ Total current by second source =1.43A</li> <li>➤ <math>I_2=0.95A</math></li> <li>➤ Load current =2.15A</li> <li>➤ Power Consumed= 13.86 watts</li> </ul>

**Part\*C**

Q.No	Question
------	----------

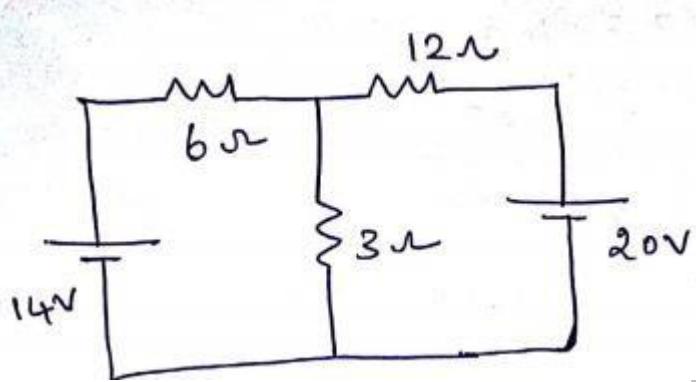
1. Calculate voltage across 3-ohm resistor by using nodal analysis. (13M). BTL2



**Answer: Page 7.4 - Dr. C. Ramesh BabuDurai**

- $\Delta=0.59$
- $V_2 = -0.49V$
- $V_3 = -0.165V$
- Voltage across 3 -ohm resistor =0.211V

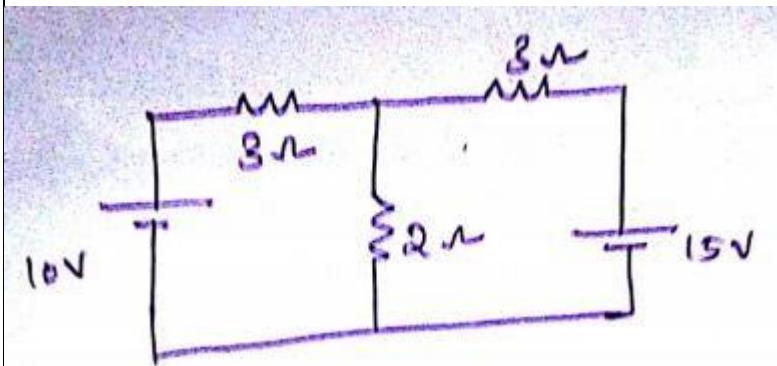
2. Calculate current through  $3 \Omega$  resistor by using Kirchoff's Laws. (13M) BTL2



**Answer: Page 7.4 - Dr. C. Ramesh BabuDurai**

- $9I_1 - 3I_2 = 14$
- $3I_1 - 15I_2 = 20$
- $I_1 = 9A$
- $I_2 = 1.1A$
- Current through 3-ohm resistor =0.8A

3. Calculate current through  $3\Omega$  resistor by using Kirchoff's Laws. (13M) (APR/MAY 2019) BTL2



Answer: Page 7.4 - Dr. C. Ramesh Babu Durai

- |  |   |
|--|---|
|  | <ul style="list-style-type: none"><li>➤ <math>5I_1 - 2I_2 = 10</math></li><li>➤ <math>2I_1 - 5I_2 = 15</math></li><li>➤ <math>I_1 = 0.96A</math></li><li>➤ <math>I_2 = -2.6A</math></li><li>➤ Current through 2-ohm resistor = <math>3.56A</math></li></ul> |
|--|---|

JIT - 2106

**SubjectCode:BE8255      Year/Semester: II/02**  
**Subject Name: BASIC ELECTRICAL, ELECTRONICS, AND MEASUREMENT ENGINEERING**  
**Subject Handler: Mr.A.Antony Charles**

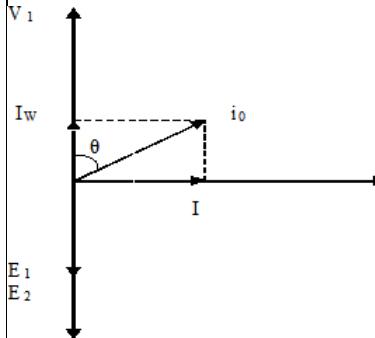
## UNIT II ELECTRICAL MACHINES

DC and AC ROTATING MACHINES: Types, Construction, principle, Emf and torque equation, application Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers-Introduction-types and construction, working principle of Ideal transformer-Emf equation- All day efficiency calculation.

### Part\*A

Q.No	Question
1.	<p><b>A 200 V DC Motor has an <math>R_a=0.06\Omega</math> and <math>R_{se}=0.04\Omega</math>. If the motor input is 20KW find the back emf of the motor and power developed in the armature.BTL5</b></p> $I = \frac{20 \times 1000}{200} = 100 \text{ A}$ $V = + + +$ <p>Back emf=190V; Power developed = <math>E_b * I_a = 19 \text{ KW}</math></p>
2.	<p><b>How are DC Machines classified ? (APR/MAY 2019)BTL2</b></p> <p>D.C Generators</p> <p>Separately excited machine.</p> <p>Self excited machine.</p> <p>Shunt generator</p> <p>Series generator</p> <p>Compound generator</p> <p>D.C Motors</p> <ul style="list-style-type: none"> <li>• Shunt</li> <li>• Series</li> <li>• Compound</li> </ul>
3.	<p><b>Define Back emf of DC motor and expression for speed ?(APR/MAY 2018)BTL1</b></p> <p>The emf induced in the armature of motor usually opposes the applied voltage. This induced emf is called as back emf or counter emf. (Lenz's law) - It acts as a governor (ie., self regulating).</p>

	$N = \frac{E_b}{\Phi} = k \frac{V - I_a R_a}{\Phi}$ V=Voltage ; $I_a$ = ArmatureCurrent; $R_a$ = ArmatureResistance
4.	<p><b>n 8 pole wave connected armature has 600 conductors and is driven at 625 rev/min. If the flux per pole is 20 mWb, Determine the generated emf.BTL5</b></p> $E_g = \frac{\Phi Z N}{60} \left( \frac{P}{A} \right)$ <p>Here A=2</p> $E_g = (0.02 * 600 * 625 * 8) / 120 E_g$ $= 500V$
5.	<p><b>DC motor operates from a 240V supply. The armature resistance is 0.2Ω. Determine the back emf when the armature current is 50A. (APR/MAY 2019)BTL5</b></p> $V = E_b + I_a R_a$ $E_b = 240 - (50 * 0.2) E_b$ $= 230 V$
6.	<p><b>What is the significance of back emf? BTL1</b></p> <p>If the back emf is zero, a high armature current flow which damages the windings. So in order to limit the armature current back emf is necessary for the machine.</p>
7.	<p><b>Write down the application of D.C series motor.BTL2</b></p> <p>Electric Trains, Cranes, hoists, elevators and conveyors, Fans and air compressors hair driers, Vacuum cleaners, Sewing machines, Traction drives, Trolley.</p>
8.	<p><b>Mention the difference between core and shell type transformer. BTL2</b></p> <p>In core type the winding surround the core considerably and in shell type the core surround the windings i.e windings is placed in central limb of the core.</p>
9.	<p><b>Define Transformation Ratio and classify the Transformer based on Transformation ratio. BTL2</b></p> <p>Transformation ratio is defined as the ratio of number of turns in the secondary winding to number of turns in primary winding.</p> $K = \frac{N_2}{N_1} = \frac{E_2}{E_1}$

	Types :Step up transformer & Step down transformer										
10.	<b>Draw the phasor diagram of a transformer in no load.BTL6</b>										
											
11.	<b>Define Slip of an induction motor. BTL1</b> <p>The difference between the synchronous speed (rotating magnetic field) and the rotor speed is known as slip. It is expressed as</p> $\% \text{Slip}(s) = \frac{N_S - N}{N_S} * 100$ <p>Where, Ns – speed of the rotating magnetic field &amp; N – Motor speed.</p>										
12.	<b>Compare Slip ring and Squirrel cage Type Rotor. (APR/MAY 2019)BTL2</b> <p>Squirrel cage: Resistance Permanently Welded, less losses ,high efficiency</p> <p>Slipring: Resistance can be added, high losses, low efficiency</p>										
13.	<b>Write the Comparison of Core and Shell type transformers BTL2</b> <table border="1"> <thead> <tr> <th>CORE TYPE</th> <th>SHELL TYPE</th> </tr> </thead> <tbody> <tr> <td>The winding encircles the core</td> <td>The core encircles most part of the winding</td> </tr> <tr> <td>It has single magnetic circuits</td> <td>It has double magnetic circuits</td> </tr> <tr> <td>The cylindrical type of coil are used</td> <td>Multilayer dick type or sandwich coil are used</td> </tr> <tr> <td>The construction preferred</td> <td>The construction preferred</td> </tr> </tbody> </table>	CORE TYPE	SHELL TYPE	The winding encircles the core	The core encircles most part of the winding	It has single magnetic circuits	It has double magnetic circuits	The cylindrical type of coil are used	Multilayer dick type or sandwich coil are used	The construction preferred	The construction preferred
CORE TYPE	SHELL TYPE										
The winding encircles the core	The core encircles most part of the winding										
It has single magnetic circuits	It has double magnetic circuits										
The cylindrical type of coil are used	Multilayer dick type or sandwich coil are used										
The construction preferred	The construction preferred										

		for low voltage transformer In single phase type ,the core has two limbs	for High voltage transformer In single phase type ,the core has three limbs	
14.	<b>Why the SC test on transformer is performed on HV side? BTL4</b> The Short Circuit test is normally conducted on HV side of the transformer and LV side is short circuited, because on the high voltage side the current rating is low .So we can use normally available meter range.			
15.	<b>Give the emf equation of a transformer and define each term. BTL2</b> Emf induced in primary coil $E_1=4.44f\Phi mN_1$ volt Emf induced in secondary Coil $E_2=4.44f\Phi mN_2$ . $f$ -----freq of ACinput $\Phi$ ----- maximum value of flux in thecore $N_1,N_2$ ----Number of primary & secondary turns			
16.	<b>Does transformer draw any current when secondary is opened? Why? BTL2</b> Yes, it (primary) will draw the current from the main supply in order to magnetize the core and to supply for iron and copper losses on no load .There will not be any current in the secondary since secondary is open.			
17.	<b>State the condition for achieving maximum torque and state the expression for maximum running torque. BTL1</b> $S_m = \frac{R_2}{X_2}$ $T_m = \frac{KE_2^2}{2X_2} N\cdot m$			
18.	<b>Why an induction motor never runs at synchronous speed? (APR/MAY 2019) BTL3</b> If it runs at synchronous speed then there would be no relative speed between the two, hence no rotor emf, so no rotor current, then no rotor torque to maintain rotation.			

19. **Why an induction motor is called a rotating transformer? BTL2**

The rotor receives same electrical power in exactly the same way as the secondary of a two winding transformer receiving power from primary. That is why induction motor is called a rotating transformer.

20.	<b>Write two extra features of slip ring induction motor BTL1</b>  Rotor has 3 phase winding ,Extra resistance can be added into the rotor circuit for speed control and also improving PF with the help of slip rings.
21	<b>What happen when a DC supply is applied to a transformer? BTL1</b>  Due to saturation of magnetic core a large current flows through the windings, without induced any emf. This large current burns the windings of the transformer.
22.	<b>Why transformers are rated in kVA? BTL4</b> Copper loss of a transformer depends on current & iron loss on voltage. Hence total losses depend on Volt-Ampere and not on PF. That is why the rating of transformers is in kVA and not in kW.
23.	<b>Distinguish power transformers &amp; distribution transformers. (APR/MAY 2019)BTL2</b>  Power transformers have very high rating in the order of MVA. They are used in generating and receiving stations. Sophisticated controls are required. Voltage ranges will be very high. Distribution transformers are used in receiving side. Voltage levels will be medium. Power ranging will be small in order of kVA. Complicated controls are not needed.
24.	<b>State all day efficiency of a transformerBTL1</b>  It is computed on the basis of energy consumed during a certain period, usually a day of 24 hrs. all day efficiency = output in kWh/input in kWh for 24 hrs.
25.	<b>Why the armature core in dc machines is constructed with laminated steel sheets instead of solid steel sheets? BTL2</b>  Lamination highly reduces the eddy current loss and steel sheets provide low reluctance path to magnetic field.
26.	<b>Why commutator is employed in d.c. machines? (APR/MAY 2018)BTL2</b>  Conduct electricity between rotating armature and fixed brushes, convert alternating emf into unidirectional emf (mechanical rectifier).
27.	<b>How does DC motor differ from DC generator in construction?BTL1</b>  Generators are normally placed in closed room and accessed by skilled operators only. Therefore, on ventilation point of view they may be constructed with large opening in the frame. Motors have to be installed right in the place of fuse which may have dust,dampness,inflammable gases, chemical.etc.to protect the motors against these elements, the motor frames are made either

	partially closed or totally closed or flame proof.										
28.	<b>What is the necessity of starter in D.Cmotors?BTL1</b> When a dc motor is directly switched on ,atthe time of starting ,the motor back emf is zero .Due to this, the armature current is very high. Due to the very high current,the motor gets damaged. To reduce the starting current of the motor a starter is used.										
29.	<b>What is meant by residual emf in DC generator?(APR/MAY 2018)BTL1</b> It is induced emf in the self-excited dc generator due to the residual magnetism.										
30.	<b>What is back emf in d.c. motor? BTL1</b> <ul style="list-style-type: none"> <li>• As the motor armature rotates, the system of conductor come across alternate north and south pole magnetic fields causing an emf induced in theconductors.</li> <li>• The direction of the emf induced in the conductor is in opposite to current. As this emf always opposes the flow of current in motor operation it is called as backemf.</li> </ul>										
31.	<b>Name any four applications of DC series motor. BTL2</b> <ul style="list-style-type: none"> <li>• Electric traction</li> <li>• Mixies</li> <li>• Hoists</li> <li>• Drilling machines</li> </ul>										
	<b>Define Step angle.BTL1</b> Step angle is the angle through which the stepper motor shaft rotates for each command pulse It is denoted by $\beta$ Step angle= $360^\circ / (\text{Number of phases} * \text{Number of rotor teeth})$										
	<b>Differentiate the Half step and Full step operation of a stepper motor. (APR/MAY 2019)BTL2</b> <table border="1"> <thead> <tr> <th>Half step</th> <th>Full step</th> </tr> </thead> <tbody> <tr> <td>Exciting three phases at a time.</td> <td>One phase is energized at any time.</td> </tr> <tr> <td>Alternate one phase on and two phase on modes of operation.</td> <td>Rotor and stator teeth are not aligned, the magnetic reluctance is large.</td> </tr> <tr> <td>Resolution gets doubled.</td> <td>Direction of rotation depends sequence in phase winding areenergized.</td> </tr> <tr> <td>Half stepping produces smoother shaft rotation.</td> <td>Independent of direction of current.</td> </tr> </tbody> </table>	Half step	Full step	Exciting three phases at a time.	One phase is energized at any time.	Alternate one phase on and two phase on modes of operation.	Rotor and stator teeth are not aligned, the magnetic reluctance is large.	Resolution gets doubled.	Direction of rotation depends sequence in phase winding areenergized.	Half stepping produces smoother shaft rotation.	Independent of direction of current.
Half step	Full step										
Exciting three phases at a time.	One phase is energized at any time.										
Alternate one phase on and two phase on modes of operation.	Rotor and stator teeth are not aligned, the magnetic reluctance is large.										
Resolution gets doubled.	Direction of rotation depends sequence in phase winding areenergized.										
Half stepping produces smoother shaft rotation.	Independent of direction of current.										

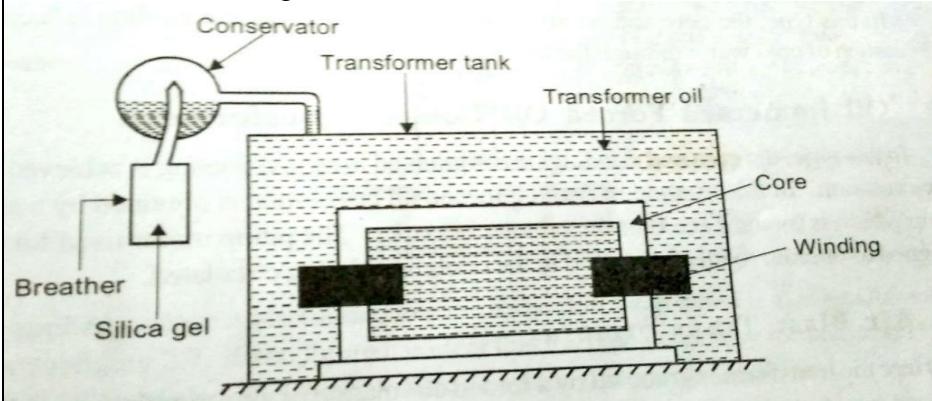
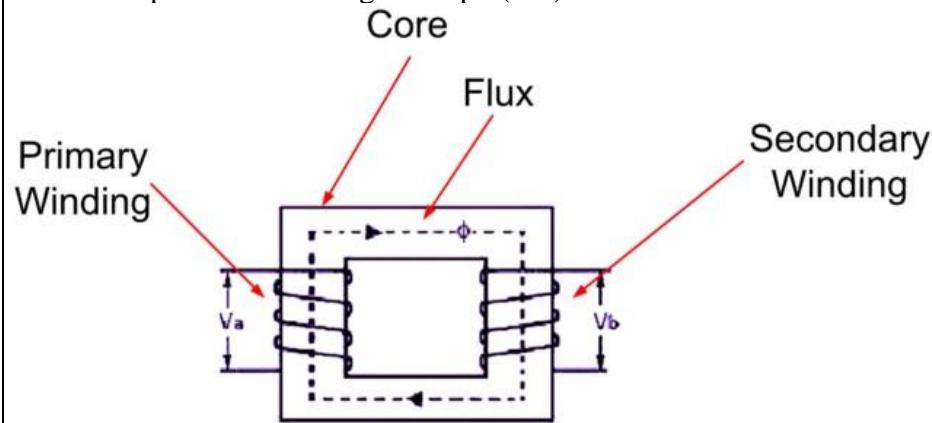
	<b>Define holding torque in stepper motors. BTL1</b>
--	--

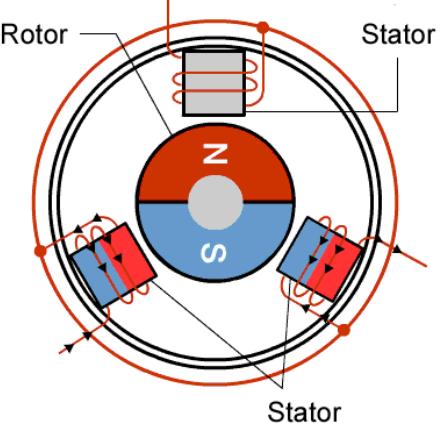
It is defined as the maximum static torque that can be applied to the shaft of an excited motor without causing continuous rotation.

**Part\*B**

<b>Q.No</b>	<b>Question</b>
-------------	-----------------

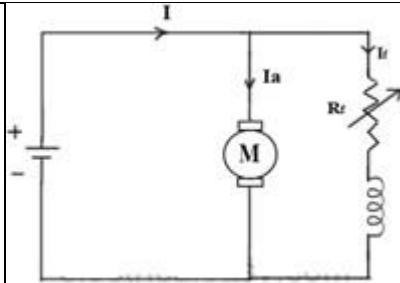
JIT - 2106

1.	<p><b>Describe the Construction and working principle of a transformer.BTL2 (13M)</b></p> <p><b>Answer: Page :4.3 – Dr.C.RameshbabuDurai</b></p> <p>➤ Draw the diagram(4M)</p>  <p>➤ Explain the parts(5M)</p> <ul style="list-style-type: none"> <li>✓ Magneticcore</li> <li>✓ Primary and SecondaryWinding</li> <li>✓ Insulation of winding</li> <li>✓ Expansion tank andConservator</li> <li>✓ Lead and tappings for coils – support, terminal and terminalinsulator</li> <li>✓ Tank , Oil , cooling arrangements , temperature gauge , oilgauge</li> <li>✓ Buchhols relay</li> <li>✓ Silica gelbreather</li> </ul> <p>➤ Explain the working Principle(4M)</p>  <ul style="list-style-type: none"> <li>✓ Electromagnetic inductionPrinciple</li> </ul>
----	---

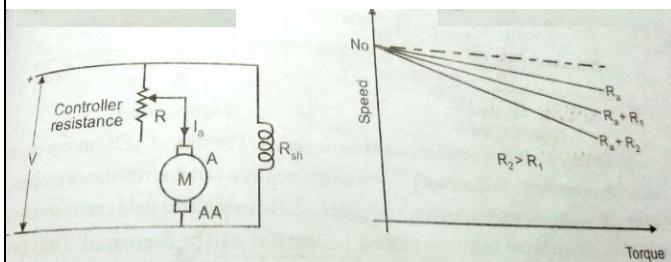
	Faradays law
2.	<p><b>Explain the working of BLDCmotor.BTL2(APR/MAY 2018)(13M)</b>  <b>Answer: Page :5.10 – Dr.C.RameshbabuDurai</b></p>  <ul style="list-style-type: none"> <li>• Brushless DC motors do not use brushes.</li> <li>• With brushed motors, the brushes deliver current through the commutator into the coils on the rotor.</li> <li>• A brushless motor pass current to the rotor coils? It doesn't—because the coils are not located on the rotor.</li> <li>• the coils do not move, there is no need for brushes and a commutator.</li> <li>• rotation is achieved by controlling the magnetic fields generated by the coils on the rotor</li> <li>• To change the rotation speed, you change the voltage for the coils.</li> <li>• A BLDC motor, it is the permanent magnet that rotates; rotation is achieved by changing the direction of the magnetic fields</li> <li>• A BLDC motor with three coils on the stator will have six electrical wires</li> <li>• Wiring in the BLDC motor case is more complicated than simply connecting the power cell's positive and negative terminals</li> <li>• One big advantage is efficiency, as these motors can control continuously at maximum rotational force(torque)</li> <li>• The second big advantage - related to the first - is controllability</li> <li>• Precision control in turn reduces energy consumption and heat generation</li> </ul>

3.	<p><b>Derive the EMF equation of a DC generator and explain about the significance of back emf .(13M) BTL3</b></p> <p><b>Answer: Page :3.11 – Dr.C.RameshbabuDurai</b></p> <ul style="list-style-type: none"><li>➤ Derive the DC generator EMF equation (10M)</li><li>✓ <math>\emptyset</math> = flux/pole in Wb(weber)</li></ul>
----	---

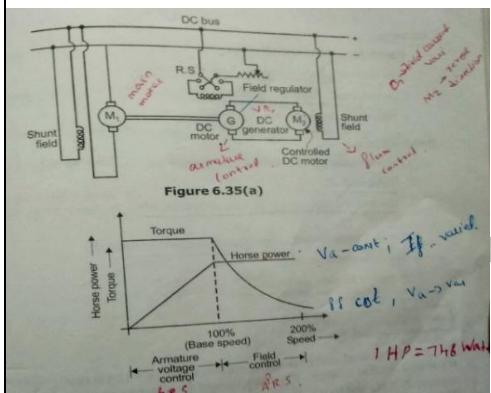
	<ul style="list-style-type: none"> <li>✓ <math>Z</math> = total no. of armature conductors</li> <li>✓ <math>P</math> = No. of generator poles</li> <li>✓ <math>A</math> = No. of parallel paths in armature</li> <li>✓ <math>N</math> = rotational speed of armature in revolutions per min.(rpm)</li> <li>✓ <math>E</math> = emf induced in any parallel path in armature</li> </ul> <p>By Faraday's law,</p> $e = PN\phi/60$ $= PN\phi/60 * Z/A \quad (3 M)$ <p>For wave A = 2 wound</p> $e = PN\phi Z/120$ <p>for lap A=P wound</p> $e = N\phi Z/60$
4.	<p><b>Describe the following methods of speed control of DC Shunt Motor (i) Flux Control Method (ii) Armature Rheostat Control Method (iii) Ward Leonard Method. (13M) BTL2</b></p> <p><b>Answer: Page :3.41 – Dr.C.RameshbabuDurai</b></p> <ul style="list-style-type: none"> <li>➤ Draw the circuit</li> <li>➤ Explain the speed control</li> </ul> <p><b>Flux control method:</b></p> <ul style="list-style-type: none"> <li>✓ Speed Control Of Dc Shunt Motor - <math>V_a</math> is the voltage applied across the armature, <math>N</math> is the rotor speed and <math>\phi</math> is the flux per pole and is proportional to the field current <math>I_f</math>.</li> <li>✓ Armature current <math>I_a</math> is decided by the mechanical load present on the shaft.</li> <li>✓ Varying <math>V_a</math> and <math>I_f</math> we can vary <math>n</math>.</li> </ul> <p><b>Varying Armature Resistance</b></p> <ul style="list-style-type: none"> <li>✓ Fixed supply voltage and the motor connected as shunt we can vary <math>V_a</math> by controlling an external resistance connected in series with the armature.</li> <li>✓ If of course can be varied by controlling external field resistance <math>R_f</math> connected with the field circuit</li> <li>✓ The inherent armature resistance <math>R_a</math> being small, speed <math>n</math> versus armature current (<math>I_a</math>) characteristic will be a straight line with a small negative slope as shown in figure.</li> </ul> <p><b>Flux Control Method</b></p>



### Armature Rheostat Control Method



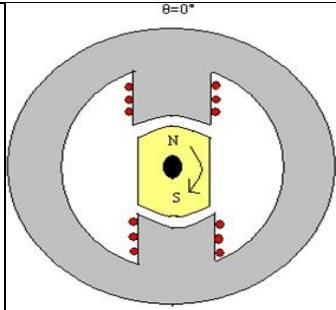
### Ward Leonard Method



5. Discuss the construction and working principle of Hybrid stepper motor with neat diagrams. (13 M) (APR/MAY 2019) BTL4

**Answer:** Page :5.9 – Dr.C.RameshbabuDurai

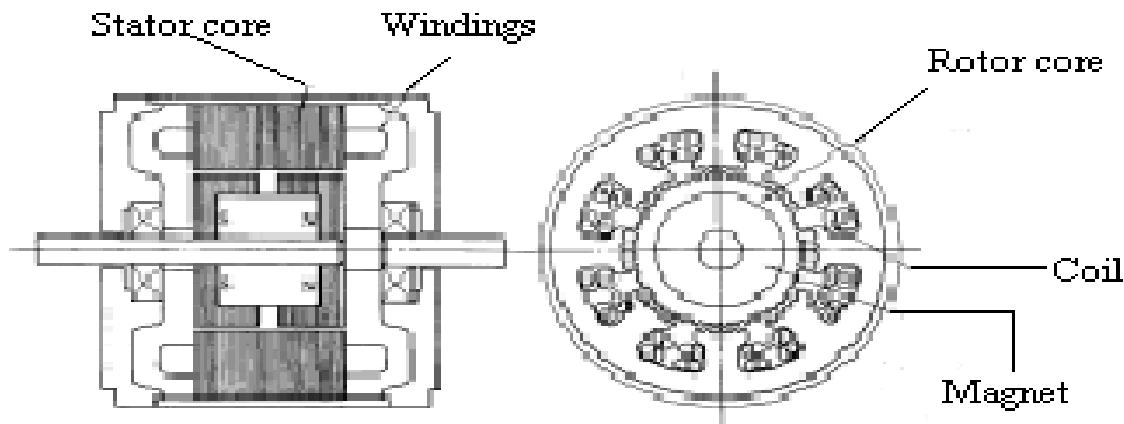
**Diagram & construction :** (2 M)



### **variable reluctance and permanent magnet motors: (2 M)**

1. It is salient pole type rotor
2. Permanent magnetrotor
3. It has the features of both VR stepper motor PMSM.
4. A four phase hybrid stepper motor shown.
5. Two coils at a pole are wound in the bifilar scheme
6. Produce different magnetic polarities on excitation.

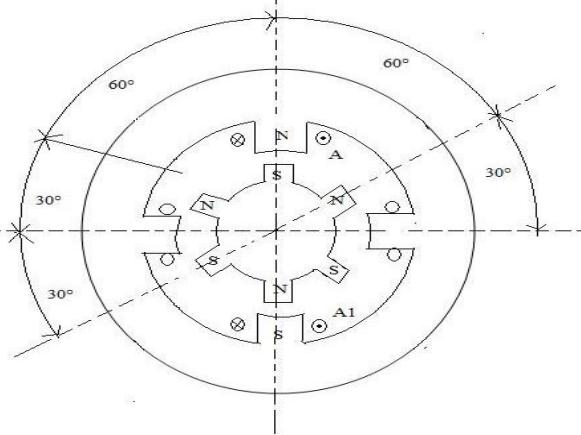
### **Cross section of hybrid stepper motor: (3 M)**



### **Hybrid stepper motor with 8 stator poles : (4 M)**

1. A cylindrical magnet lies in the rotorcore.
2. Magnetized lengthwise to produce a unipolarfield.
3. Each pole of the magnet covered with uniformly toothed softsteel.

### **Principle of operation : (2 M)**



1. Phase winding A is energized with current  $i_a$ , N pole at  $A_1$  and S pole at  $A_2$  are created on the stator.
2. Pole at  $A_1$  attracts S pole of far end and pole at  $A_2$  attracts N pole of frontend.
3. This equilibrium position of rotor structure results in maximizing the flux linkages
4. phase winding 'A'. Here rotation  $\theta=0^\circ$
5. For the rotor clockwise through a step, de-energize phase winding A excite phase winding B so that N pole at  $B_2$  are created on stator.

6.	<p><b>Explain stepper motor type merits, demerits and comparison. (15 M) BTL5</b></p> <p><b>Answer: Page :5.9– Dr.C.RameshbabuDurai</b></p> <p><b>Advantages and disadvantages of variable reluctance motor : (5 M)</b></p> <ol style="list-style-type: none"> <li>1. High torque to inertiaratio</li> <li>2. Low rotorinertia</li> <li>3. High rates of acceleration</li> <li>4. High speed slewingcapability</li> <li>5. No detent torque available when windings are deenergized</li> <li>6. Low efficiency at lowvoltage</li> </ol> <p><b>Advantages and disadvantages of permanent magnet stepper motor : (5 M)</b></p> <ol style="list-style-type: none"> <li>1. Provides detent torque winding deenergized</li> <li>2. Higher holding torquecapability</li> <li>3. Less tendency toresonate.</li> <li>4. High stepping ratecapability.</li> <li>5. Slower acceleration andresponse.</li> <li>6. Performance affected by change in magnetstrength.</li> </ol> <p><b>Advantages and disadvantages of hybrid stepper motor : (5 M)</b></p> <ol style="list-style-type: none"> <li>1. Small steplength.</li> <li>2. Detent torque with windings deenergized.</li> <li>3. Higher holding torquecapability.</li> <li>4. More expensive than variable reluctance steppermotor.</li> </ol>
----	---

	5.Performance affected by change in magnet strength.
--	--

JIT - 2106

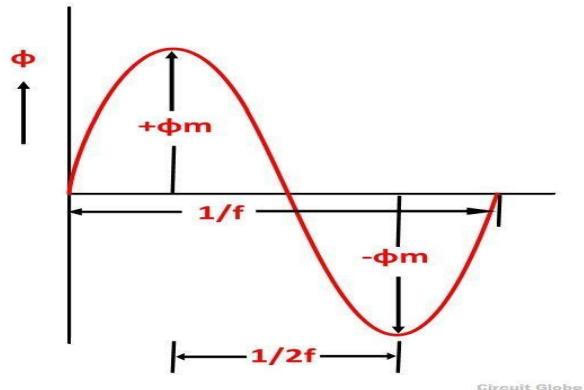
7. Derive the EMF equation of a Static AC machine or Transformer.BTL3(APR/MAY)

2018)(13M) Answer: Page :4.6 – Dr.C.RameshbabuDurai

- When a sinusoidal voltage - applied to the primary winding of a transformer
- Alternating flux  $\phi_m$  sets up in the iron core of the transformer.
- This sinusoidal flux links with both primary and secondary winding.
- The function of flux is a sinefunction.
- The rate of change of flux with respect to time is derivedmathematically.

The derivation of **EMF Equation** of the transformer is shown below. Let

- $\phi_m$  be the maximum value of flux inWeber
- $f$  be the supply frequency inHz
- $N_1$  is the number of turns in the primarywinding
- $N_2$  is the number of turns in the secondarywinding
- $\Phi$  is the flux per turn inWeber



As shown in the above figure that the flux changes from  $+Φ_m$  to  $-Φ_m$  in half a cycle of  $1/2f$  seconds.

By Faraday's Law

Let  $E_1$  is the emf induced in the primary winding

$$E_1 = - \frac{d\psi}{dt}$$

Where  $\psi = N_1\phi$

$$E_1 = -N_1 \frac{d\phi}{dt}$$

$$E_1 \text{max} = N_1 w \phi_m$$

But  $w = 2\pi f$

$$E_1 \text{max} = 2\pi f N_1 \phi_m$$

EMF Equation of a Transformer

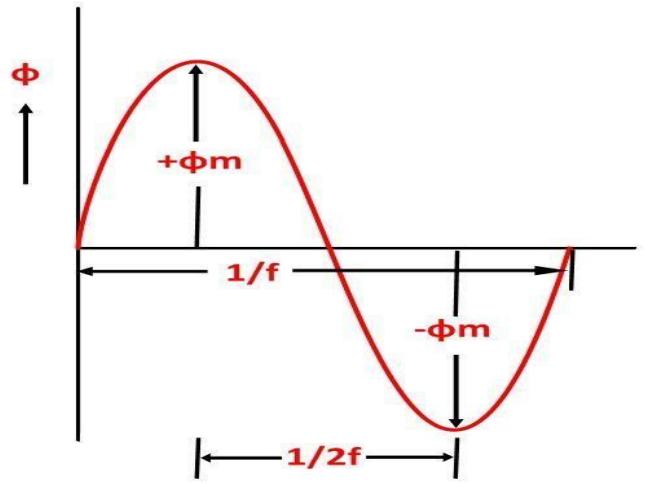
EMF Equation of a Transformer

- When a sinusoidal voltage is applied to the primary winding of a transformer, alternating flux  $\phi_m$  sets up in the iron core of the transformer.
- This sinusoidal flux links with both primary and secondary winding.
- The function of flux is a sinefunction.
- The rate of change of flux with respect to time is derived mathematically.

The derivation of **EMF Equation** of the transformer is shown below. Let

- $\phi_m$  be the maximum value of flux in Weber
- $f$  be the supply frequency in Hz
- $N_1$  is the number of turns in the primary winding
- $N_2$  is the number of turns in the secondary winding

$\Phi$  is the flux per turn in Weber



Circuit Globe

As shown in the above figure that the flux changes from  $+ \phi_m$  to  $- \phi_m$  in half a cycle of  $1/2f$

seconds.

By Faraday's Law

Let  $E_1$  is the emf induced in the primary winding

$$E_1 = -\frac{d\Psi}{dt} \dots \dots \dots (1)$$

Where  $\Psi = N_1\phi$

$$\text{Therefore, } E_1 = -N_1 \frac{d\phi}{dt} \dots \dots \dots (2)$$

Since  $\phi$  is due to AC supply  $\phi = \phi_m \sin \omega t$

$$E_1 = -N_1 \frac{d}{dt} (\phi_m \sin \omega t)$$

$$E_1 = -N_1 w \phi_m \cos \omega t$$

$$E_1 = N_1 w \phi_m \sin(\omega t - \pi/2) \dots \dots \dots (3)$$

So the induced emf lags flux by 90 degrees.

Maximum value of emf

$$E_{1\max} = N_1 w \phi_m \dots \dots \dots (4)$$

But  $w = 2\pi f$

$$E_{1\max} = 2\pi f N_1 \phi_m \dots \dots \dots (5)$$

$$\frac{\text{R.M.S value}}{\text{Average value}} = \text{Form factor} = 1.11$$

Root mean square RMS value is

$$E_1 = \frac{E_{1\max}}{\sqrt{2}}$$

Putting the value of  $E_{1\max}$  in equation

$$E_1 = \sqrt{2\pi f N_1 \varphi_m}$$

$$E_1 = 4.44 f N_1 \varphi_m$$

$$E_2 = \sqrt{2\pi f N_2 \varphi_m}$$

$$\frac{E_2}{E_1} = \frac{4.44 f N_2 \varphi_m}{4.44 f N_1 \varphi_m}$$

$$\frac{E_2}{E_1} = \frac{N_2}{N_1} = K$$

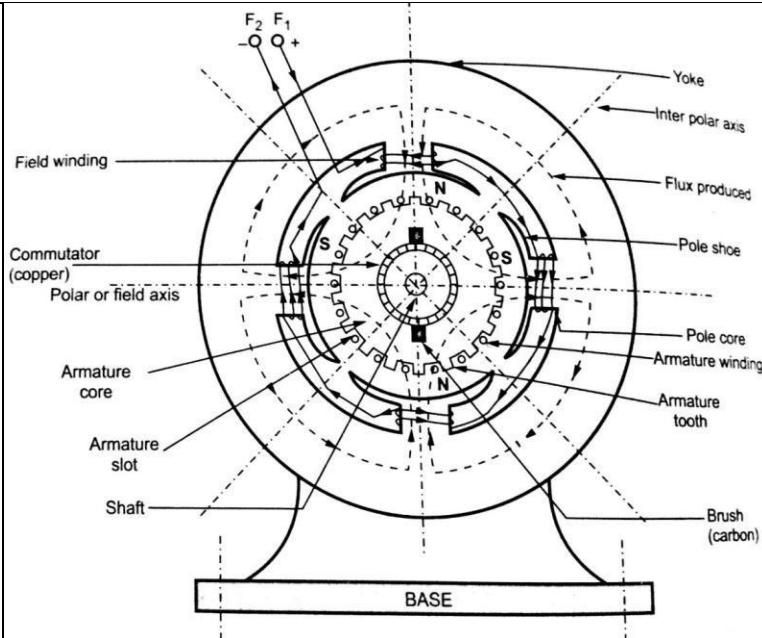
( $\varphi_m = B_m \times A_i$ ) where  $A_i$  is the iron area and  $B_m$  is the maximum value of flux density.

$$E_1 = 4.44 N_1 f B_m A_i \text{ Volts}$$

$$E_2 = 4.44 N_2 f B_m A_i \text{ Volts}$$

### Part\*C

Q.No	Question
1.	<p><b>Describe the construction and principle of operation of DC generator. (13M)(APR/MAY 2018)BTL2</b></p> <p><b>Answer: Page :3.3 – Dr.C.RameshbabuDurai</b></p> <ul style="list-style-type: none"> <li>➤ Draw the diagram (7M)</li> <li>➤ Explain the parts in detail(6M)</li> </ul>



- The major parts can be identified as
  - ✓ Frame/Yoke -Protecting cover
  - ✓ Poles of Technology Madras
  - ✓ Armature – laminated sheets of silicon steel
  - ✓ Main pole and interpole
  - ✓ Winding – small section copper
  - ✓ Commutator – DC to AC
  - ✓ Brush gear – supply to external circuit
  - ✓ Commutating poles
  - ✓ Compensating winding- reduce the sparking

2.	<p>A 8pole DC shunt generator with 778 wave connected armature conductors and running at 500 rpm supplies a load of <math>12.5\Omega</math> resistance at a terminal voltage of 250 V. The armature resistance is <math>0.24 \Omega</math> and field resistance is <math>250 \Omega</math> respectively. Calculate the armature current and induced emf and flux per pole. (13M)(APR/MAY 2018)BTL4</p> <p><b>Answer:</b> Page :3.49 – Dr.C.RameshbabuDurai</p> <ul style="list-style-type: none"> <li>➤ Write the formula</li> <li>➤ Substitution with answerLoad current <math>I_L</math> <math>=V/R_L</math> <math>=20A</math> (2M)</li> </ul> <p>Shunt field current <math>I_{sh}=V/R_{sh}</math> <math>=1 A</math>(2 M)</p>
----	---

	Armature current $I_a = I_L + I_{sh}$ (2 M) = 21 A (1 M) Induced EMF $E_g = V + I_a R_a$ (2M ) = 255.04 A(1M) Flux per pole ( $\phi$ ) = $P \cdot \phi Z N / 60A$ (2M) = 19.66 mwb(1M)
3.	<b>Find all day efficiency of a transformer having maximum efficiency of 98% at 15 Kva at unity power factor and loaded as follows:</b>  <b>12 hours – 2 KW at 0.5 p.flag</b>  <b>6 hours – 12 KW at 0.8 p.flag</b>  <b>6 hours – atno load BTL4</b>  <b>Answer: Page :4.9 – Dr.C.RameshbabuDurai</b>  ➤ Write the formula (7M) ➤ Answer (6M) Input power = output power/efficiency (2 M) = 5.306 kW (1M) Total losses = Input power – output power (2M) = 0.306 kW (1M) Full load copper loss = Iron loss = Total loss/ 2 (1M) = 0.153 kW (2M) $\eta$ all-day = Output power in Kwh/ Input power in kWh * 100 (2M) = 95.31% (2M)

**SubjectCode:BE8255****Year/Semester: II/02****Subject Name: BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING****Subject Handler: Mr.A.Antony Charles****UNIT III UTILIZATION OF ELECTRICAL POWER**

Renewable energy sources-wind and solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Domestic refrigerator and air conditioner-Electric circuit, construction and working principle. Batteries-NiCd, Pb Acid and Li ion-Charge and Discharge Characteristics. Protection- need for earthing, fuses and circuit breakers. Energy Tariff calculation for domestic loads.

**Part\*A**

<b>Q.No</b>	<b>Question</b>
1.	<b>Define Light. (APR/MAY 2018)BTL2</b>  Light may be defined as that radiant energy in form of waves which produces a sensation of vision upon human eye
2.	<b>Define Luminous Flux. BTL2</b>  Luminous flux is defined as the energy in the form of light waves radiated per second from a luminous body.  Eg for a luminous body is an incandescent lamp.
3.	<b>Define Illumination or Illuminance or Degree of Illumination. BTL2</b>  When the light falls on the surface it is illuminated. The illuminance is defined as the luminous flux received per unit area. Let the incident luminous flux on a small area $dA$ be $dF$ then $\text{Illuminance} = dF/dA = \text{lumens}/\text{area}$
4.	<b>Define Lumen. BTL2</b>  Lumen is the unit of flux and is defined as the luminous flux per unit angle from a source 1 candle power. $\text{Lumens} = \text{candle power} \times \text{solid angle} = \text{candle power} \times \omega$
5.	<b>Define Candle Power. (APR/MAY 2018)BTL2</b>  Candle power is the number of lumens per unit solid angle. $\text{Candle power} = \text{lumens}/\omega$ .

6.	<b>Define Luminous Intensity. BTL2</b>  The luminous intensity is the measure of luminous flux in lumens emitted per unit solid angle by a point source and is denoted by $I$ , $I = \Phi/\omega$
7.	<b>What are the two laws of illumination? BTL1</b> <ul style="list-style-type: none"> <li>• Inverse squarelaw.</li> <li>• Lambert's cosinelaw.</li> </ul>
8.	<b>State inverse square law. BTL1</b>  This law states that illumination of a surface is inversely proportional to the square of the distance of the surface from the source of light, under the condition that source is the point source.
9.	<b>State Lambert's law. BTL1</b>  This law states that illumination of a surface at any point is dependent upon the cube of cosine of the angle between the line of flux and the normal at that point.
10.	<b>Define Brightness or Luminance.(APR/MAY 2018)BTL2</b>  It is defined as the flux emitted per unit area or the luminous intensity per unit projected area of the source in a direction perpendicular to the surface. The unit of brightness is candles per sq.m.
11.	<b>Why tungsten is used as filament material ?BTL2</b>  Pure tungsten has properties including the highest melting point (3695 K), lowest vapour pressure, and greatest tensile strength out of all the metals.
12.	<b>List the types of lamps. BTL2</b>  Sodium vapour lamps, fluorescent lamp, neon lamp, mercury vapour lamp

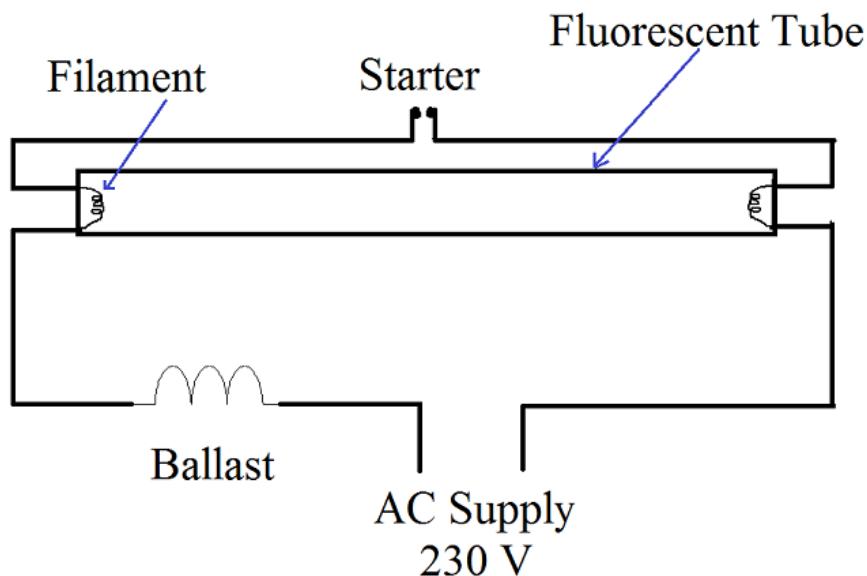
13.	<b>How does operation of a fluorescent tube differ when it is used on ac and dc supply? BTL4</b>  Fluorescent lamps can run directly from a direct current (DC) supply of sufficient voltage to strike an arc. The ballast must be resistive, and would consume about as much power as the lamp. When operated from DC, the starting switch is often arranged to reverse the polarity of the supply to the lamp each time it is started; otherwise, the mercury accumulates at one end of the tube. Fluorescent lamps are (almost) never operated directly from DC for those reasons. Instead, an inverter converts the DC into AC and provides the current-limiting function for electronic ballasts
-----	---

14.	<b>Define Wind. BTL2</b>  Wind results from air motion. Air in motion arises from a pressure gradient. The circulation of air in the atmosphere is caused by the non- uniform heating of the earth's surface by the sun.
15.	<b>What are the different causes of local winds? BTL2</b> <ul style="list-style-type: none"> <li>• Differential heating of land and water</li> <li>• Air heating in hills and mountainsides.</li> </ul>
16.	<b>What are the major components of WCS?(APR/MAY 2018) BTL1</b> <ul style="list-style-type: none"> <li>• Aeroturbine</li> <li>• Gearing</li> <li>• Coupling</li> <li>• Generator and</li> <li>• Controller</li> </ul>
17.	<b>What are the broad classification of WECS? BTL1</b>  There are two broad classifications of WECS, they are <ul style="list-style-type: none"> <li>• Horizontal axis machines and</li> <li>• Vertical axis machines</li> </ul>
18.	<b>List the advantages of WECS. BTL2</b>  The advantages of wind energy are, <ul style="list-style-type: none"> <li>• It is a renewable source of energy,</li> <li>• Non-polluting,</li> <li>• Avoid fuel provision and transport,</li> <li>• Small scale up to few KW system is less costly</li> </ul>
19.	<b>How are the following defects caused in lead acid batteries Sulphation ? BTL1</b>  A badly desulphated battery has got injured plate grids and separators because of swelling of the plate as the sulphate occupies more space than the active materials. A badly sulphated battery may be restored to a usable condition, but its original life expectancy can never be restored as it has

	already lost part of its life due to sulphation
20.	<p><b>What is need for earthing, fuse and circuit breakers?</b></p> <p><b>Earthing</b> is used to protect you from an electric shock. It does this by providing a path (a protective conductor) for a fault current to flow to <b>earth</b>. It also causes the protective device (either a circuit-breaker or fuse) to switch off the electric current to the circuit that has the fault.</p> <p>The <b>fuse</b> breaks the circuit if a fault in an appliance causes too much current flow. This protects the wiring and the appliance if something goes wrong. The <b>fuse</b> contains a piece of wire that melts easily. If the current going through the <b>fuse</b> is too great, the wire heats up until it melts and breaks the circuit.</p> <p>A <b>circuit breaker</b> is an automatically operated electrical switch designed to protect an electrical <b>circuit</b> from damage caused by excess current, typically resulting from an overload or short <b>circuit</b>. Its basic function is to interrupt current flow after a fault is detected</p>
21	<p><b>What is a battery? Mention its applications.</b> BTL1</p> <p>A battery is an electrochemical cell (or enclosed and protected material) that can be charged electrically to provide a static potential for power or released electrical charge when needed.</p> <p>A battery generally consists of an anode, a cathode, and an electrolyte. Eg:- Lead acid battery, ion, Nickel Cadmium battery.</p> <p>Applications: Mobile phones, Toys, calculators and Automobiles</p>

**Part\*B**

Q.No	Question
1.	<p><b>Explain Fluorescent lamb.(13M) (APR/MAY 2018)BTL1</b></p> <p><b>Answer:</b> Page :6.9 – Dr.C.RameshbabuDurai</p>

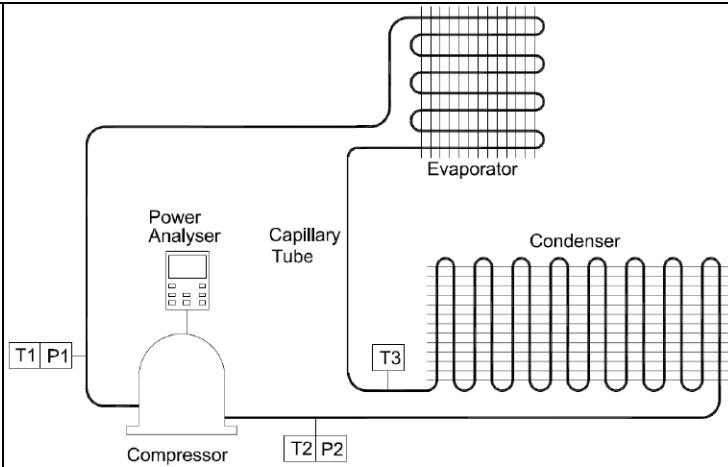


- Electric current passes through a column of mercuryvapor.
- The UV is emitted in all directions, until it hits the the phosphor coating on theinner wall.
- The coating re-emits lower energy long wavelength visiblelight
- When the tungsten (W) filament is heated, its special coating will boil off electrons,not light.
- If the coating is too thin, it will fail early because of the sudden heating at turn-oncan cause expansion, cracking or flaking. (Image from the Wikipedia OpenCommons.)
- Care must be taken to keep the tungsten from evaporating onto the tube inner wall;it can lead to a thick opaque layer, blockinglight.
- This flows between the filaments and is needed to bounce against the Hg atoms,causing UVemission.
- A key point not often mentioned is the startup process needed to generate the beam and Hg vapor at an acceptable range ofttemperatures.

2.

**Explain Domestic refrigerator. BTL1**  
**Answer: Page :6.11 – Dr.C.RameshbabuDurai**

JIT - 2106



- The domestic refrigerator is one found in almost all the homes for storing food, vegetables, fruits, beverages, and muchmore.
- This article describes the important parts of the domestic refrigerator and also their working.
- The parts of domestic refrigerator can be categorized into two categories: internal and external. Let see these in details along with theirimages.

#### **Refrigerant:**

- The refrigerant flows through all the internal parts of the refrigerator. It is the refrigerant that carries out the cooling effect in theevaporator.
- It absorbs the heat from the substance to be cooled in the evaporator (chiller or freezer) and throws it to the atmosphere viacondenser.
- The refrigerant keeps on recirculating through all the internal parts of the refrigerator incycle.

#### **Compressor:**

- The compressor is located at the back of the refrigerator and in the bottomarea.
- The compressor sucks the refrigerant from the evaporator and discharges it at high pressure andtemperature.
- The compressor is driven by the electric motor and it is the major power consuming devise of therefrigerator.

#### **Condenser:**

- The condenser is the thin coil of copper tubing located at the back of therefrigerator.
- The refrigerant from the compressor enters the condenser where it is cooled by the atmospheric air thus losing heat absorbed by it in the evaporator and thecompressor.
- To increase the heat transfer rate of the condenser, it is finnedexternally.

#### **Expansive valve or the capillary:**

- The refrigerant leaving the condenser enters the expansion devise, which is the capillary tube in case of the domesticrefrigerators.
- The capillary is the thin copper tubing made up of number of turns of the copper coil. When the refrigerant is passed through the capillary its pressure and temperature drops down suddenly.

	<b>Evaporator or chiller or freezer:</b>
--	--

	<ul style="list-style-type: none"> <li>The refrigerant at very low pressure and temperature enters the evaporator or the freezer.</li> <li>The evaporator is the heat exchanger made up of several turns of copper or aluminum tubing.</li> <li>In domestic refrigerators the plate types of evaporator is used as shown in the figure above.</li> <li>The refrigerant absorbs the heat from the substance to be cooled in the evaporator, gets evaporated and it then sucked by the compressor. This cycle keeps on repeating.</li> </ul> <p><b>Temperature control device or thermostat:</b></p> <ul style="list-style-type: none"> <li>To control the temperature inside the refrigerator there is thermostat, whose sensor is connected to the evaporator.</li> <li>The thermostat setting can be done by the round knob inside the refrigerator compartment.</li> <li>When the set temperature is reached inside the refrigerator the thermostat stops the electric supply to the compressor and compressor stops</li> <li>when the temperature falls below certain level it restarts the supply to the compressor.</li> </ul> <p><b>Defrost system:</b></p> <ul style="list-style-type: none"> <li>The defrost system of the refrigerator helps removing the excess ice from the surface of the evaporator.</li> <li>The defrost system can be operated manually by the thermostat button or there is automatic system comprising of the electric heater and the timer.</li> </ul>
3.	<p><b>Explain about Ni Cd batteries. BTL1</b></p> <p><b>Answer: Page :6.22 – Dr.C.RameshbabuDurai</b></p> <p><b>Nickel–Cadmium battery (NiCd battery or NiCad battery):</b></p> <ul style="list-style-type: none"> <li>The <b>nickel–cadmium battery (NiCd battery or NiCad battery)</b> is a type of rechargeable battery using nickel oxide hydroxide and metallic cadmium as electrodes.</li> <li>The abbreviation NiCd is derived from the chemical symbols of nickel (Ni) and cadmium (Cd): the abbreviation NiCad is a registered trademark of SAFT Corporation, although this brand name is commonly used to describe all Ni–Cd batteries.</li> <li>NiCd batteries are made in a wide range of sizes and capacities, from portable sealed types interchangeable with carbon-zinc dry cells, to large ventilated cells used for standby power and motive power.</li> <li>Compared with other types of rechargeable cells they offer good cycle life and performance at low temperatures with a fair capacity but their significant advantage is the ability to deliver practically their full rated capacity at high discharge rates (discharging in one hour or less).</li> </ul>

4. Explain about Lithium batteries. BTL1

**Answer: Page :6.25 – Dr.C.RameshbabuDurai**

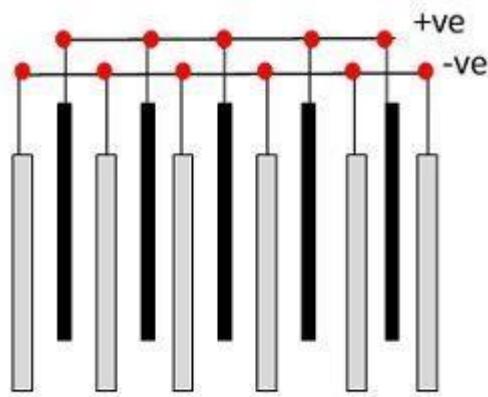
#### LITHIUM ION BATTERY

- basically the same for the two types of batteries, so charging methods for lithium polymer batteries can be used for lithium-ion batteries.
- Charging lithium iron phosphate 3.2 volt cells is identical, but the constant voltage phase is limited to 3.65volts.
- The lithium ion battery is easy to charge. Charging safely is a more difficult.
- The basic algorithm is to charge at constant current (0.2 C to 0.7 C depending on manufacturer) until the battery reaches 4.2 Vpc (volts per cell),
- hold the voltage at 4.2 volts until
- The charge current has dropped to 10% of the initial charge rate. The termination condition is the drop in charge current to 10%.
- The top charging voltage and the termination current varies slightly with the manufacturer

5.	<p><b>Explain about Lead Acid batteries. BTL1</b></p> <p><b>Answer: Page :6.19 – Dr.C.RameshbabuDurai</b></p> <p><b>Construction of Lead Acid Battery</b></p> <p>The various parts of the lead acid LED ACID BATTERY</p> <ul style="list-style-type: none"> <li>• The battery which uses sponge lead and lead peroxide for the conversion of the chemical energy into electrical power, such type of battery is called a lead acidbattery.</li> <li>• The lead acid battery is most commonly used in the power stations and substations because it has higher cell voltage and lowercost.</li> <li>• The container and the plates are the main part of the lead acidbattery.</li> <li>• The container stores chemical energy which is converted into electrical energy by the help of theplates.</li> </ul> <p><b>Definition:</b></p> <ul style="list-style-type: none"> <li>• The battery which uses sponge lead and lead peroxide for the conversion of the chemical energy into electrical power, such type of battery is called a lead acidbattery.</li> <li>• The lead acid battery is most commonly used in the power stations and substations because it has higher cell voltage and lowercost..</li> <li>• The container and the plates are the main part of the lead acidbattery.</li> <li>• The container stores chemical energy which is converted into electrical energy bythe help of theplates.</li> </ul>
----	--

**Container :**

- The container of the lead acid battery is made of glass, lead lined wood, ebonite, the hard rubber or bituminous compound, ceramic materials or moulded plastics - sealed at the top to avoid the discharge of electrolyte.
- At the bottom of the container, there are four ribs, on two of them rest the positive plate and the others support the negative plates.
- The prism serves as the support for the plates and at the same time protect them from short-circuit.
- The material of which the battery containers are made should be resistant to sulfuric acid, should not deform or porous, - contain impurities which damage the electrolyte.



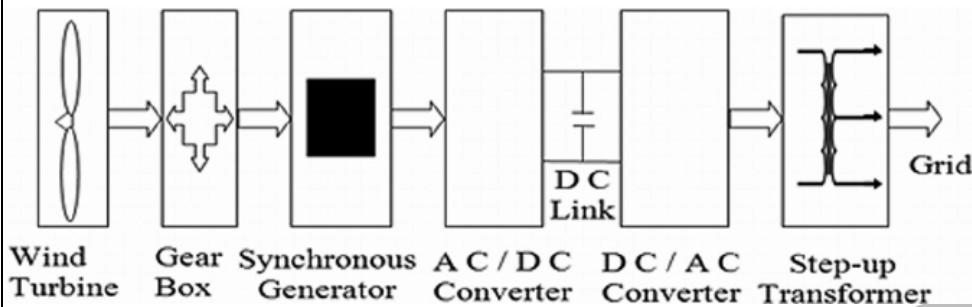
**Arrangements of Plates in a Lead-acid-Battery** Circuit Globe

- The grids are made up of an alloy of lead and antimony.
- These are usually made with the transverse rib that crosses the plates at a right angle or diagonally.
- The grid for the positive and negative plates are of the same design,
- the grids for the negative plates are made lighter because they are not as essential for the uniform conduction of the current.

**Part\*C**

Q.No	Question

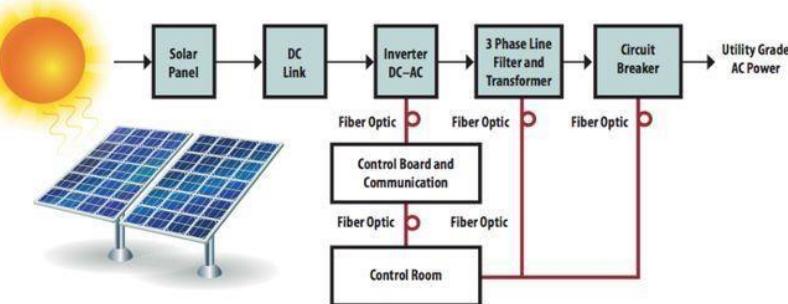
1.	<p><b>Explain the wind energy. BTL1</b></p> <p><b>Answer: Page :6.2 – Dr.C.RameshbabuDurai</b></p>
----	--



- Like old fashioned windmills, today's wind machines use blades to collect the wind's kinetic energy.
- Windmills work because they slow down the speed of the wind.
- The wind flows over the airfoil shaped blades causing lift, like the effect on airplane wings, causing them to turn.
- The blades are connected to a drive shaft that turns an electric generator to produce electricity.
- With the new wind machines, there is still the problem of what to do when the wind isn't blowing.
- At those times, other types of power plants must be used to make electricity.
- Wind power plants, or wind farms as they are sometimes called, are clusters of wind machines used to produce electricity.
- A wind farm usually has dozens of wind machines scattered over a large area. The world's largest windfarm,
- the Horse Hollow Wind Energy Center in Texas, has 421 wind turbines that generate enough electricity to power 220,000 homes per year. Unlike power plants, many wind plants are not owned by public utility companies.
- Instead they are owned and operated by business people who sell the electricity produced on the wind farm to electric utilities.
- These private companies are known as Independent Power Producers.
- Operating a wind power plant is not as simple as just building a windmill in a windy place.
- Wind plant owners must carefully plan where to locate their machines. One important thing to consider is how fast and how much the wind blows

2.

**Explain solar power plant. BTL1****Answer: Page :6.3– Dr.C.RameshbabuDurai**

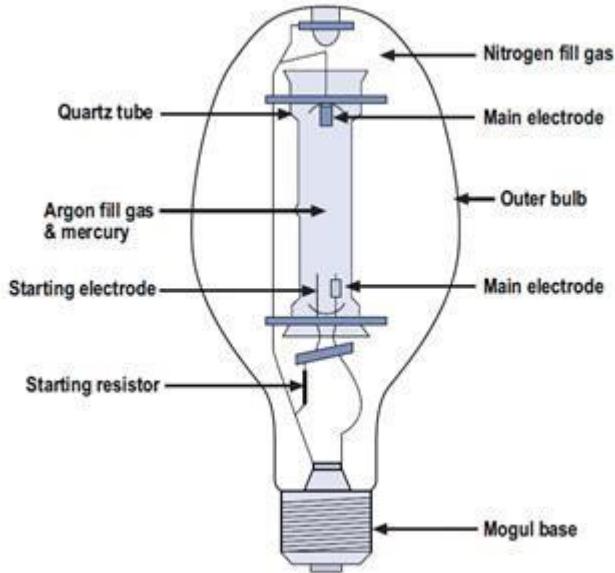


- Solar energy is the energy that is available from the sun in abundance. Solar power is the conversion of sunlight into electricity.
- As electricity plays a key role in our day to day life we need it in abundance, as sunlight is clean, and is available for free solar power is created from it.
- A solar power plant is basically a system that supplies electricity to wide areas.
- The solar power tower system has many sun tracking mirrors installed that help in tracking sunlight into a central receiver.
- In the solar thermal power system, the radiation of the sun heats the thermal oil that flows inside the receivers to a temperature of 400 degree Celsius so that the downstream heat exchanger can generate steam.
- The stream is then pressurized into the turbine that drives the generator. Thus the heat collected by the receiver is used as electricity for performing various activities and purposes.
- Electricity can be generated in two ways with the help of solar energy or sun's energy.
- It can be generated Firstly, with the help of photo voltaic electricity and secondly with solar thermal electricity.
- Photovoltaic electricity is a method that uses photovoltaic cells to capture direct sunlight. The photovoltaic cells are nothing but solar cells.
- The solar thermal electricity on the other hand makes use of a solar collector which has mirror for reflecting sunlight into the receiver that heats up the liquid and the heated liquid produces steam which is used to produce electricity.

3.

**Explain sodium vapour lamp. BTL1**

**Answer: Page :6.7 – Dr.C.RameshbabuDurai**



- Principally the sodium vapour lamp consists of the bulb containing a small amount of metallic sodium, neon gas, and two sets of electrodes connected in a pin typebase.
  - The presence of neon gas serves to start the discharge envelope is usually bent into U shape.
  - The sodium vapour lamp is only suitable for a alternating current, the, therefore, required chockcontrol.
  - This requirement is met by operating the lamp for a stray field – up -tapped-autotransformer with an open circuit secondary voltage of 470 to 480Volts.
  - The corrected power factor very low, about 0.3 and a capacitor must be used to improve the powerfactor.
  - A sodium-vapor lamp is a gas-discharge lamp that uses sodium in an excited state to produce light at a characteristic wavelength near 589nm.
  - They are some of the most efficient lamps in theworld.
  - They have an efficiency of up to 190 lumens per watt compared to an incandescent street lamp which has between 15 and 19 lumens perwatt.
  - Low-pressure sodium lamps: They are highly efficient electrical light sources, but their yellow light restricts applications to outdoor lighting such as streetlamps.
  - Low-pressure sodium lamps only give monochromatic yellow light and so inhibit color vision atnight
  - High-pressure sodium lamps produce a broader spectrum of light than the low-pressure lamps, but they still have poorer color rendering than other types oflamps.
  - The tube is made of borosilicate glass to withstand pressure and temperature and contains some sodium metal, neon and argon.
- When the lamp is switched on, the sodium vaporises and an arc is established.

**SubjectCode:BE8355**

**Year/Semester:** II /02

## **Subject Name: BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING**

**Subject Handler: Mr.A.Antony Charles**

## **UNIT IV ELECTRONIC CIRCUITS**

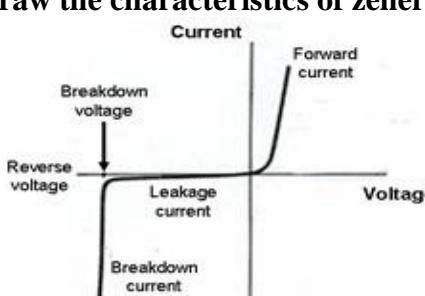
**PN Junction-VI Characteristics of Diode, zener diode, Transistors configurations - amplifiers. Op amps- Amplifiers, oscillator, rectifiers, differentiator, integrator, ADC, DAC. Multi vibrator using 555 Timer IC . Voltage regulator IC using LM 723, LM 317.**

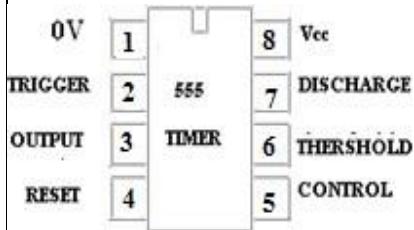
Part\*A

5.	<b>Define and explain Peak Inverse Voltage (PIV). (APR/MAY 2019)BTL1</b> Peak inverse voltage is the maximum reverse voltage that can be applied to the PN junction without damage to the junction. If the reverse voltage across the junction exceeds to its peak inverse voltage, the junction may be destroyed due to excessive heat.
6.	<b>Define the term diffusion capacitance or storage capacitance. BTL1</b> a. The diffusion capacitance effect is found when the diode is forward biased and it is defined as the rate of change of injected charge with voltage and given by $C_d = \frac{\tau I}{\eta V_T}$ <p>I = diode current, <math>V_T</math> = volt equivalent temperature. <math>V_T = T / 11,600</math>  Constant (<math>\eta</math>) = 1 for Ge diodes, 2 for silicon diodes; <math>\tau</math> = mean life time.</p>
7.	<b>Define the term transition capacitance. BTL1</b> When P-N junction is reverse biased the depletion region act as an insulator or as a dielectric medium and the P-type an N-type region have low resistance and act as the plates. Thus this P-N junction can be considered as a parallel plate capacitor. This junction capacitance is called as space charge capacitance or transition capacitance and is denoted as $C_T$ . $C_T = \frac{dQ}{dV}$ <p>Where <math>dQ</math> is the increase in charge and <math>dV</math> is the change or increase in voltage. The depletion region increases with the increase in reverse bias potential the resulting transition capacitance decreases. The formula for transition capacitance is given as <math>C_T = A\varepsilon/W</math>, where <math>A</math> is the cross sectional area of the region, and <math>W</math> is the width.</p>
8.	<b>Define Static resistance and Dynamic resistance.(APR/MAY 2019)BTL1</b> The resistance offered by the diode to DC operating conditions is called “Static resistance” and the resistance offered by the diode to AC operating conditions is called “Dynamic resistance”.
9.	<b>What is meant by biasing a transistor? BTL1</b> Transistor biasing is the process of maintaining proper flow of zero signal collector current and collector-emitter voltage during the passage of signal. Biasing keeps emitter-base junction forward biased and collector-base junction reverse biased during the passage of signal.
10.	<b>What is Zener breakdown? BTL1</b> When a PN junction is heavily doped the depletion region is very narrow. So under reverse bias condition, the electric field across the depletion layer is very intense. Electric field is voltage per distance and due to narrow depletion region and high reverse voltage, it is intense. Such an intense field is enough to pull the electrons out of the valence bands of the stable atoms. So this is not due to the collision of carriers with atoms. Such a creation of free electrons is called Zener effect which is different than the avalanche effect. These minority carriers constitute very large current and mechanism is called Zener Breakdown.

11. **When should a transistor be biased? Name two common biasing circuits.** BTL3

For proper operation of transistor, input junction should be forward biased and the output junction

	should be reverse biased. Common base and common emitter configuration are the two common biasing circuits.
12.	<b>Draw the characteristics of zener diode. BTL1</b> 
13.	<b>What is an op-amp? List its functions and application. BTL2</b> The op-amp is a multi-terminal device, which internally is quite complex. It is a direct coupled high gain amplifier consisting of one or more differential amplifiers, followed by a level translator and an output stage. <b>Function:</b> Op-amp amplifies the difference between two input signals and can perform some of the applications of op-amp in open loop mode are as follows: b. Comparator, Zero crossing detectors, Window detector, Time marker generator. <b>Some of the applications of op-amp in closed loop mode are as follows:</b> c. Amplifiers, Basic arithmetic operations – summer, subtractor, multiplier, integrator, differentiator, Rectifiers, Waveform generators, Filters.
14.	<b>What is the function of 555 timer and list its features and application? BTL1</b> <ul style="list-style-type: none"> <li>The 555 timer is a highly stable device for generating accurate time delay or oscillation.</li> <li>The 555 timer can be used with supply voltage in the range of +5 V to +18 V and can drive load upto 200mA.</li> <li>It is compatible with both TTL and CMOS logiccircuits.</li> <li>Because of the wide range of supply voltage, it is versatile and easy to use in variousapplications</li> <li>Some of the applications of 555timer</li> <li>Monostable mode: Missing pulse detector, linear ramp generator, Frequency divider and Pulse width modulator. <ul style="list-style-type: none"> <li>Astablemode: FSK generator, Pulse position modulator and Schmitttrigger</li> </ul> </li> </ul>
15.	<b>Draw the pin diagram of IC 555 timer. BTL1</b>



	<b>16. What is the value of open loop gain and output impedance of an ideal op-amp? BTL1</b> Open loop voltage gain, AOL = $\infty$ ; Output impedance, $R_o = 0$
17.	<b>Define input offset current and input offset voltage. BTL1</b> Input Offset Current: The algebraic difference between the currents into the (-) input and (+) input is referred to as input offset current .It is 200nA maximum for 741C. Input Offset Voltage: It is the voltage that must be applied between the input terminals of an op-amp to nullify the output. Since this voltage could be positive or negative.
18.	<b>Draw a non-inverting amplifier with voltage gain of 3. BTL1</b> $\frac{V_o}{V_i} = 1 + \frac{R_f}{R_i} \rightarrow 3 = 1 + \frac{R_f}{R_i}$ <p>Let <math>R_i = 1\text{k}\Omega</math>; <math>R_f = 2\text{k}\Omega</math></p>
19.	<b>Define the term settling time and conversion time related to DAC's. BTL1</b> <b>Settling time:</b> The most important dynamic parameter is the settling time. It represents the time it takes for the output to settle within a specified band + or - (1/2) LSB of its final value following a code change at the input (usually a full scale change). <b>Conversion time:</b> The time in which the expected analog output changes the result for changes in digital input values.
20.	<b>How many resistors are required in a 12-bit weighted resistor DAC? BTL2</b> Generally a n-bit weighted resistor DAC requires n resistors. Therefore a 12-bit weighted resistor DAC requires 12 resistors.

21.	<b>How many comparators are required to design a 10 bit flash ADC? BTL2</b>
-----	---



27. **What is N-type Semiconductor? BTL1**

- When an impurity, from V group elements like arsenic (As), antimony having 5 valence electrons is added to Ge (or Si), the impurity atom donates one electron to Ge (or Si).
- The 4 electrons of the impurity atom is engaged in covalent bonding with Si atom.
- The fifth electron is free. This increases the conductivity.
- The impurities are called donors.

	<ul style="list-style-type: none"> <li>The impurity added semiconductor is called n-type semiconductor, because their increased conductivity is due to the presence of the negatively charged electrons, which are called the majority carriers.</li> <li>The energy band of the electrons donated by the impurity atoms is just below the conduction band.</li> <li>These holes in n-type are called minority carriers.</li> </ul>
28.	<p><b>What is Extrinsic Semiconductor? BTL1</b></p> <p>The electrical conductivity of a pure semiconductor is very small.</p> <p>To increase the conductivity, impurities are added.</p> <p>The impurity added semiconductor is called extrinsic semiconductor. The process of adding impurity is called doping.</p> <p>The added impurity is called dopant.</p> <p>Usually one or two atoms of impurity is added per <math>10^6</math> atoms of a semiconductor.</p> <p>There are two types (i) p-type and (ii) n-type semiconductors</p>
29.	<p><b>What is Intrinsic Semiconductor? BTL1</b></p> <ul style="list-style-type: none"> <li>An intrinsic semiconductor also called an undoped semiconductor or i-type semiconductor.</li> <li>It is a pure semiconductor without any significant dopant species present.</li> <li>In intrinsic semiconductors the number of excited electrons and the number of holes are equal: <math>n = p</math>.</li> <li>Both electrons and holes contribute to current flow in an intrinsic semiconductor.</li> </ul>
30.	<p><b>What is conductor? BTL1</b></p> <p>A material through which electric current can pass. In general, metals are good <b>conductors</b>. Copper or aluminum is normally used to conduct electricity in commercial and household systems. Only free electrons near the Fermi surface (energy <math>F \approx E_F</math>) can conduct. To conduct electrons must acquire energy to jump from the valence to the conduction band.</p>
31.	<p><b>What are insulators? Give examples? BTL1</b></p> <p>A material or an object that does not easily allow heat, electricity, light, or sound to pass through it. Air, cloth and rubber are good electrical insulators; feathers and wool make good thermal <b>insulators</b>.</p>

32.	<b>What are Semiconductors? Give examples? BTL1</b> • A semiconductor is a solid material that has electrical conductivity between those of a
-----	--

	<p>conductor and an insulator.</p> <ul style="list-style-type: none"><li>• A material with electrical conductivity due to electron flow intermediate in magnitude between that of a conductor and an insulator.</li><li>• Silicon is the most widely used semiconductor material.</li><li>• The number of electrons in the valence orbit is the key to conductivity.</li><li>• Conductors have one valence electron, semiconductors have four valence electrons, and insulators have eight valence electrons.</li></ul>
<b>Q.No</b>	<b>PART B</b> <b>Question</b>

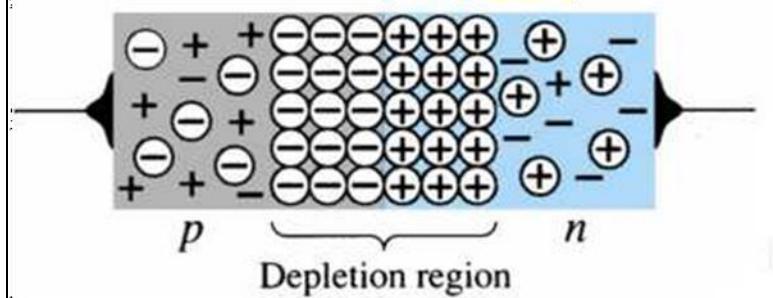
1. With a neat diagram, explain the working of a PN junction diode in forward bias and reverse bias and explain its VI characteristics. (13M) (APR/MAY 2019) BTL2

**Answer:** Page 7.4 - Dr. C. Ramesh Babu Durai

Diagram: 2M

Construction: 3M

Forward bias and reverse bias: 8M



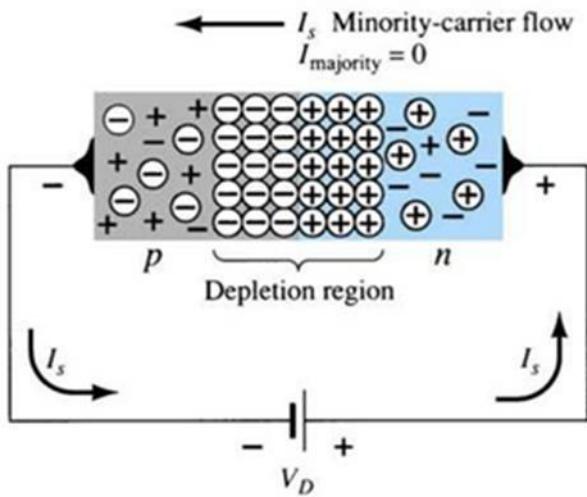
At the *p-n* junction, the excess conduction-band electrons on the *n*-type side are attracted to the valence-band holes on the *p*-type side.

The electrons in the *n*-type material migrate across the junction to the *p*-type material (electron flow).

The electron migration results in a negative charge on the *p*-type side of the junction and a positive charge on the *n*-type side of the junction.

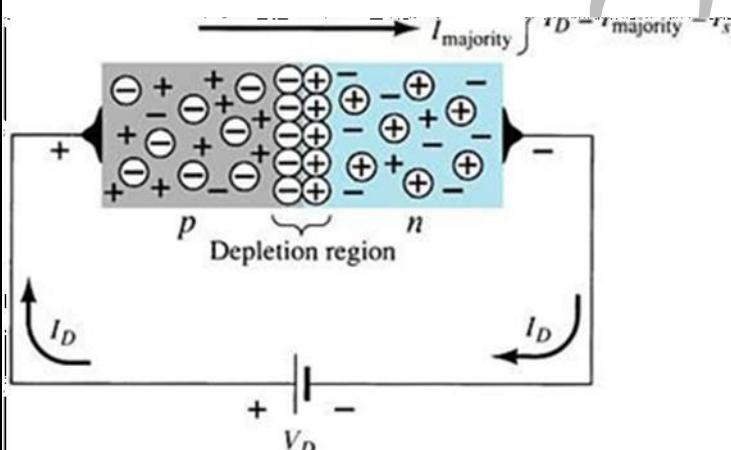
The result is the formation of a depletion region around the junction.

**Reverse Bias:**



External voltage is applied across the  $p$ - $n$  junction in the opposite polarity of the  $p$ - and  $n$ -type materials.

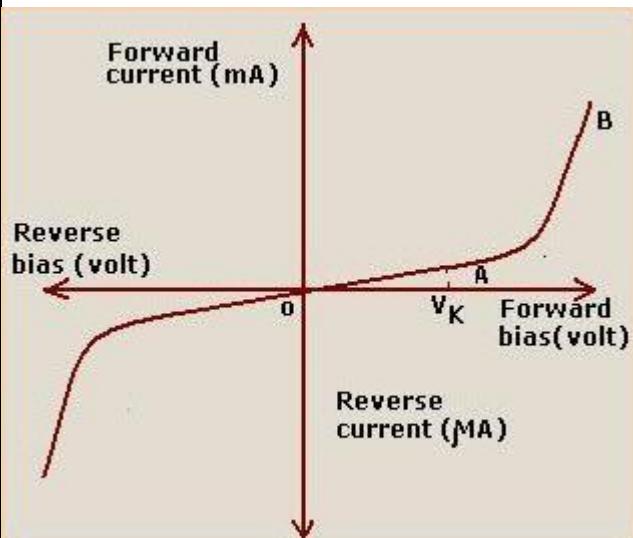
### Forward Bias:



External voltage is applied across the  $p$ - $n$  junction in the same polarity as the  $p$ - and  $n$ -type materials.

the same polarity as the  $p$ - and  $n$ -type

### VI characteristics:

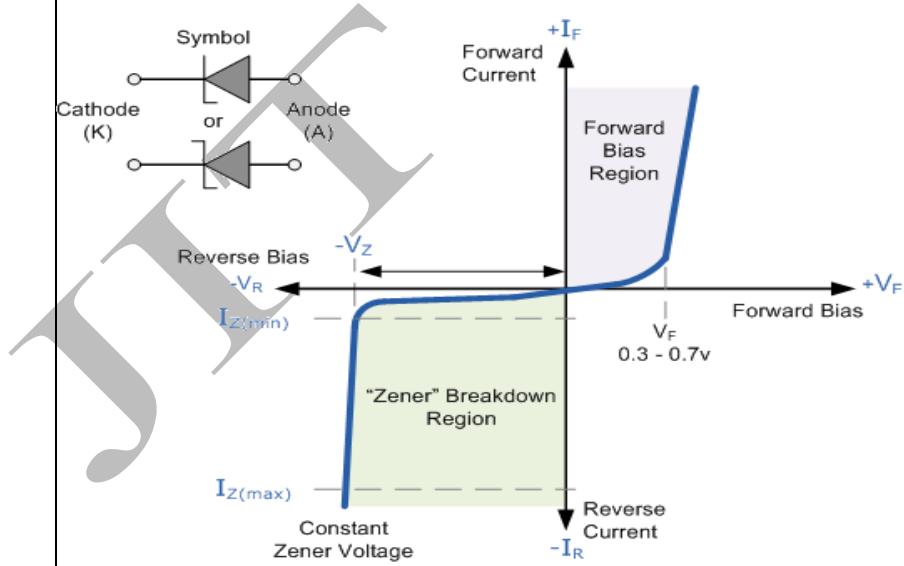


2. Explain the VI characteristics of Zener diode.(13M)BTL2

**Answer:** Page 7.10 - Dr. C. Ramesh Babu Durai

#### Zener diode:

1. Definition and Symbol(2M)
2. Forward Bias (2M)
3. Reverse Bias (2M)
4. VI characteristics(3M)
5. Zener diode as voltage regulator(2M)



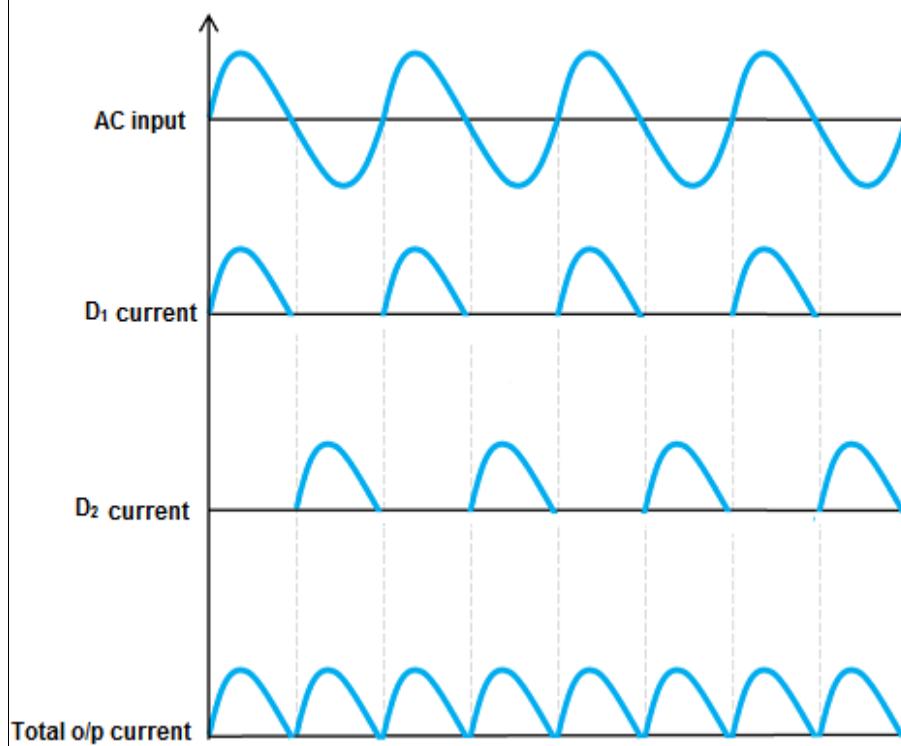
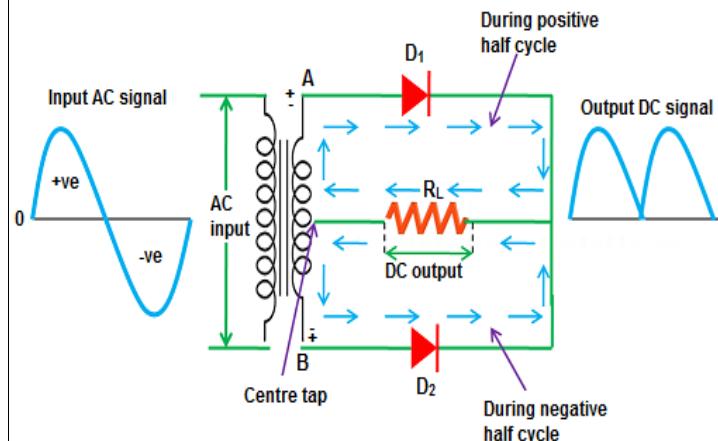
JIT - 2106

3. Draw the circuit diagram and explain the working of full wave rectifier and derive the expression of average output voltage and rectification efficiency. (13M)BTL3

**Answer: Page 7.22 - Dr. C. Ramesh Babu Durai**

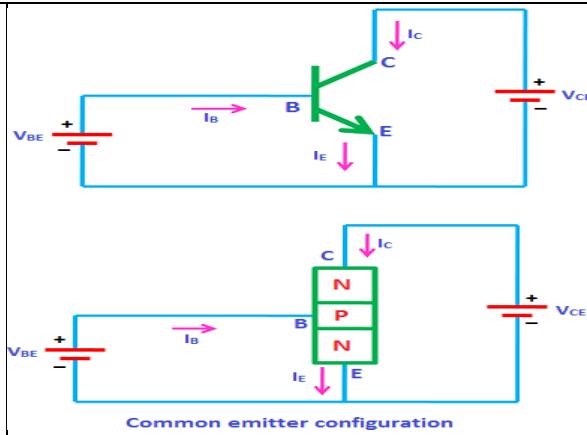
Construction and working: 5M Derivation:

8M (Each 4)



	Ripple factor $\gamma = 0.48$
--	-------------------------------

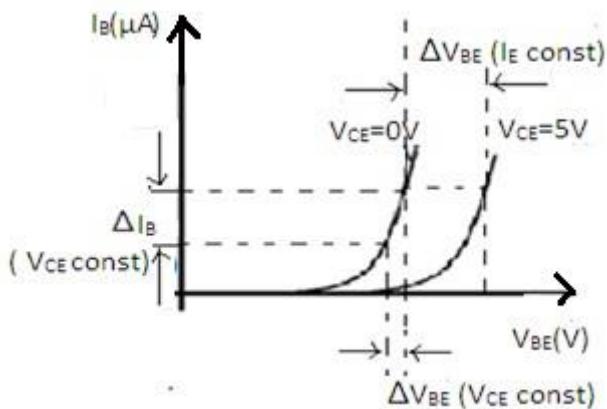
	<p>The rectifier efficiency of a full wave rectifier is 81.2%.</p> $V_{DC} = 2V_{max}/\pi$
4.	<p><b>What is half wave rectifier? Explain the working with neat sketch. (13M) (APR/MAY 2019)BTL2</b></p> <p><b>Answer: Page 7.15 - Dr. C. Ramesh BabuDurai</b></p> <p>Construction and working: 5M Derivation:</p> <p>8M ( Each 4)</p> <p>I = Current D = Diode R<sub>L</sub> = Load resistor T = Transformer + = Positive half cycle - = Negative half cycle</p> <p style="text-align: center;"><b>Half wave rectifier</b></p> <p>Ripple factor: <math>\gamma = 1.21</math></p> <p>The rectifier efficiency of a half wave rectifier is 40.6%</p>
5.	<p><b>Draw and explain the input and output characteristics of a BJT in CE configuration(13M) BTL2</b></p> <p><b>Answer: Page 8.9 - Dr. C. Ramesh BabuDurai</b></p> <p>CE configuration diagram and explanation: 5M</p> <p>Input and output characteristics: 8M (Diagram- each 2, explanation- each 2)</p>



### Input characteristics:

The output voltage  $V_{CE}$  is maintained constant and the input voltage  $V_{BE}$  is set at several convenient levels. For each level of input voltage, the input current  $I_B$  is recorded.

$I_B$  is then plotted versus  $V_{BE}$  to give the common-base input characteristics.



### Output characteristics:

The Base current  $I_B$  is held constant at each of several fixed levels. For each fixed value of  $I_B$ , the output voltage  $V_{CE}$  is adjusted in convenient steps and the corresponding levels of collector current  $I_C$  are recorded.

For each fixed value of  $I_B$ ,  $I_C$  level is Recorded at each  $V_{CE}$  step. For each  $I_B$  level,  $I_C$  is plotted versus  $V_{CE}$  to give a family of characteristics.

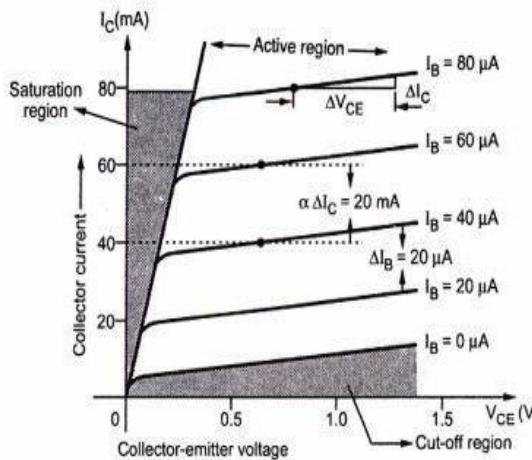


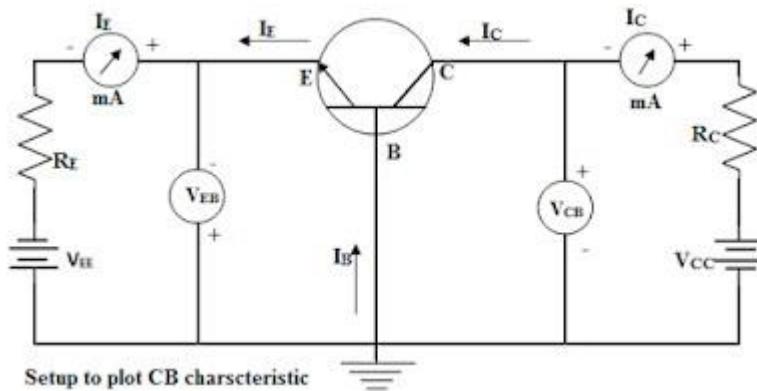
Fig 3.3: Output characteristics of the transistor in CE configuration

6. Explain the input and output characteristics in CB configuration and explain the early effect.  
(13M) BTL2

**Answer: Page 8.6 - Dr. C. Ramesh Babu Durai**

CB configuration diagram and explanation, early effect: 5M

Input and output characteristics: 8M (Diagram- each 2, explanation- each 2)

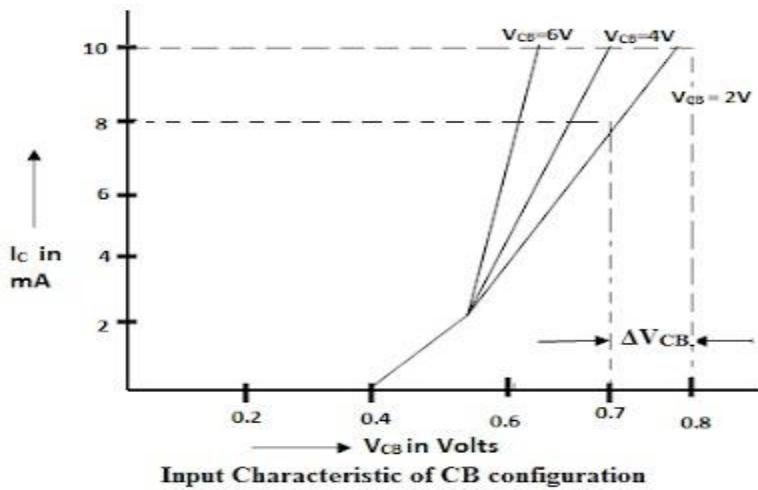


#### Input characteristics:

The output(CB) voltage is maintained constant and the input voltage (EB) is set at several convenient levels. For each level of input voltage, the input current  $I_E$  is recorded.

$I_E$  is then plotted versus  $V_{EB}$  to give the common-base input characteristics.

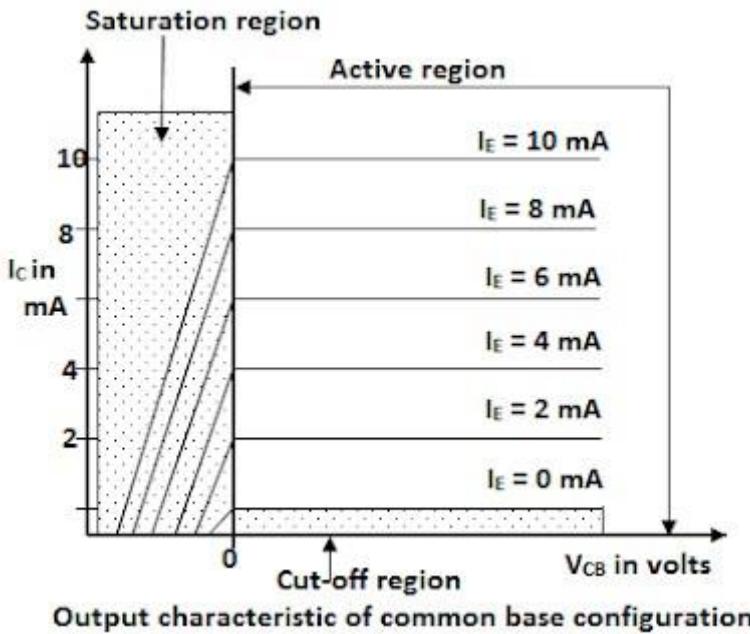
JIT - 2106



### Output characteristics:

The emitter current  $I_E$  is held constant at each of several fixed levels. For each fixed value of  $I_E$ , the output voltage  $V_{CB}$  is adjusted in convenient steps and the corresponding levels of collector current  $I_C$  are recorded.

For each fixed value of  $I_E$ ,  $I_C$  is almost equal to  $I_E$  and appears to remain constant when  $V_{CB}$  is increased.



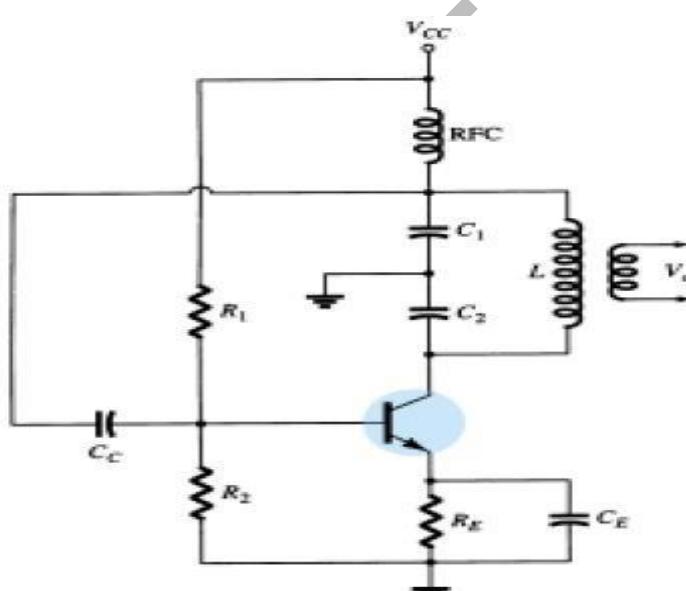
### Early effect:

The variation in the effective width of the base in a bipolar junction transistor (BJT) due to a variation

in the applied base-to-collector voltage. A greater reverse bias across the collector-base

junction, for example, increases the collector-base depletion width, thereby decreasing the width of the charge carrier portion of the base.

### Part\*C

Q.N o	Question
1.	<p><b>Explain the operation of Colpitts oscillator with neat circuit diagram. Also derive the expressions for the frequency of oscillation and the condition for maintenance of oscillation. (15M)</b>  <b>(APR/MAY 2019)BTL3</b></p> <p><b>Answer: Page 8.29 - Dr. C. Ramesh Babu Durai</b></p> <p>General equation for the oscillator: 4M</p> <p>Diagram: 3M</p> <p>Derivation: 8M</p> <div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <math display="block">f_o = \frac{1}{2\pi\sqrt{LC_{eq}}}</math> </div> <div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <math display="block">C_{eq} = \frac{C_1 C_2}{C_1 + C_2}</math> </div> 

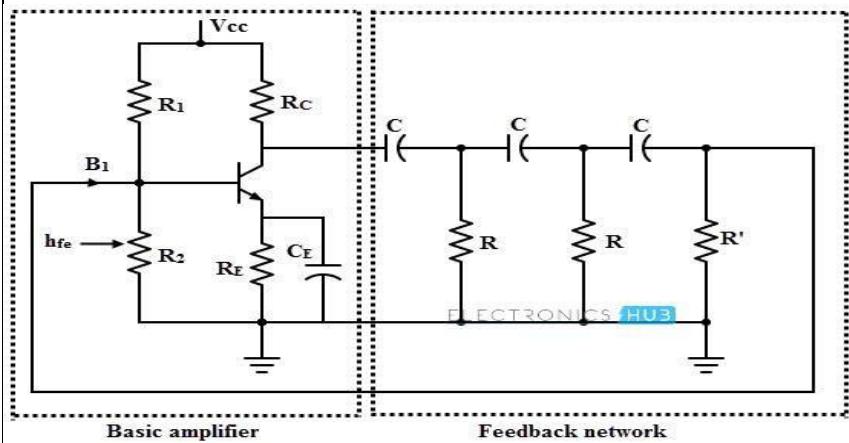
- |    |  |
|----|--|
| 2. | <p><b>Explain the operation of RC phase shift oscillator with neat circuit diagram. Also derive the expressions for the frequency of oscillation and the condition for maintenance of oscillation.</b></p> |
|----|--|

(15M) BTL3

**Answer: Page 8.29 - Dr. C. Ramesh BabuDurai**

Diagram and explanation: 5M

Derivation: 10M



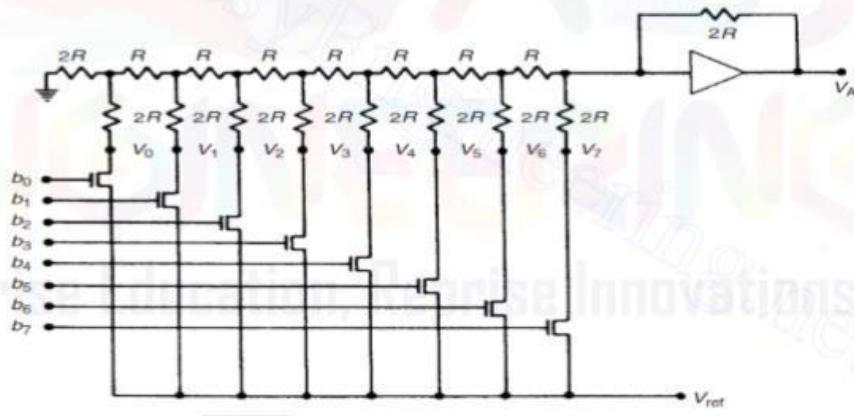
Oscillator with a feedback network consisting of three RC high-pass networks connected in serie that produce  $180^\circ$  phaseshift.

$$f = \frac{1}{2\pi RC\sqrt{6}}$$

$$\beta = \frac{1}{29}$$

$$A > 29$$

3.	<p><b>a)i) Explain the binary weighted resistor technique of D/A conversion. (8M)(APR/MAY 2019)BTL3</b></p> <p><b>Answer: Page 8.37 - Dr. C. Ramesh BabuDurai</b></p> <ul style="list-style-type: none"> <li>• Binary weighted resistor DAC block diagram &amp;Explanation</li> </ul> <p>Digital-to-analogue conversion is much simpler to achieve than analogue-to-digital conversion and the cost of building the necessary hardware circuit is considerably less. It is required wherever a digitally processed signal has to be presented to an analogue control actuator or an analogue signal display device. A common form of digital-to analogue converter is illustrated in Figure 5.24. This is shown with 8 bits for simplicity of explanation, although in practice 10 and 12 bit D/A converters are used more frequently. This form of D/A converter consists of a resistor-ladder network on the input to an operational amplifier.</p>
----	---



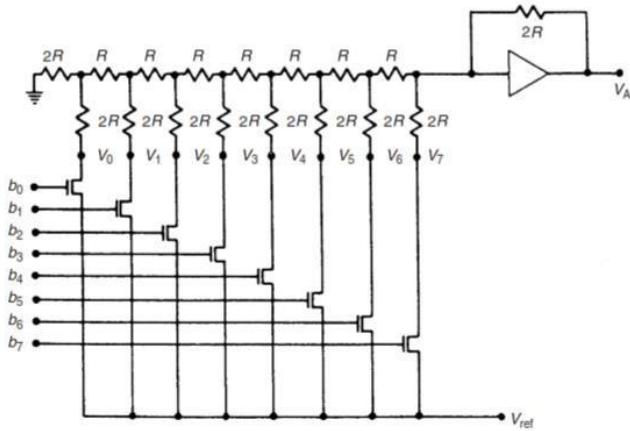
$$V_7 = V_6 = V_4 = V_2 = V_{\text{ref}}; \quad V_5 = V_3 = V_1 = V_0 = 0$$

The analogue output from the converter is then given by:

$$V_A = V_{\text{ref}} + \frac{V_{\text{ref}}}{2} + \frac{V_{\text{ref}}}{8} + \frac{V_{\text{ref}}}{32}$$

a) ii) Discuss R-2R& inverter R-2R ladder type D/A converter. (7M)(APR/MAY 2019) BTL3  
Answer: Page 8.39 - Dr. C. Ramesh Babu Durai

- R-2R ladder type converter circuit diagram(3M)



- Explanation(4M)
- Digital-to-analogue conversion is much simpler to achieve than analogue-to-digital conversion and the cost of building the necessary hardware circuit is considerably less. It is required wherever a digitally processed signal has to be presented to an analogue control actuator or an analogue signal display device.
- This is shown with 8 bits for simplicity of explanation, although in practice 10 and 12 bit D/A converters are used more frequently. This form of D/A converter consists of a resistor-ladder network on the input to an operational amplifier.

	$V_A = V_7 + \frac{V_6}{2} + \frac{V_5}{4} + \frac{V_4}{8} + \frac{V_3}{16} + \frac{V_2}{32} + \frac{V_1}{64} + \frac{V_0}{128}$ <p>V0 to V7 are set at either the reference voltage level Vref or at zero volts according to whether an associated switch is open or closed. Each switch is controlled by the logic level of one of the bits 0–7 of the 8-bit binary signal being converted. A particular switch is open if the relevant binary bit has a value of 0 and closed if the value is 1.</p>
4.	<p><b>Explain the successive approximation type ADC. (15M) BTL3</b></p> <p><b>Answer: Page 8.45 - Dr. C. Ramesh Babu Durai</b></p> <ul style="list-style-type: none"> <li>• Block diagram(6M)</li> <li>• Working operation(6M) <ul style="list-style-type: none"> <li>1. When start command is given, SAR sets MSB, d1=1 with all other bits to zero so that the trail code is 1000 0000. The output Vd from DAC is now compared with analog input Va. If Va&gt;Vd, then 1000 0000 is less than correct digital representation.</li> <li>2. This procedure is, repeated for all subsequent bits (i.e., from MSB to LSB), one at a time until all bits positions have been tested.</li> </ul> </li> <li>• Advantages:(3M) <ul style="list-style-type: none"> <li>1. High resolution</li> <li>2. It is very versatile</li> <li>3. High speed</li> </ul> </li> </ul>
5.	<p><b>Explain the various types of ADC with suitable sketches. (15M) BTL3</b></p> <p><b>Answer: Page 8.41 - Dr. C. Ramesh Babu Durai</b></p> <ul style="list-style-type: none"> <li>1. Direct type</li> <li>2. Indirect type</li> <li>• Direct types are classified as(3M) <ul style="list-style-type: none"> <li>1. Flash (comparator) type converter</li> <li>2. Staircase type converter</li> <li>3. Tracking or servo converter</li> <li>4. Successive approximation type converter</li> </ul> </li> <li>• Indirect type are classified as(2M) <ul style="list-style-type: none"> <li>1. Charge balancing analog to digital converter</li> <li>2. Dual slope analog to digital converter</li> </ul> </li> <li>• Explanation of each type(10M)</li> </ul>

**SubjectCode:BE8255****Year/Semester: II/02****Subject Name: BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENTENGINEERING****Subject Handler: Mr.A.Antony charles****UNIT V ELECTRICAL MEASUREMENT**

**Characteristic of measurement-errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Energy meter and watt meter. Transducers-classification-thermo electric, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope-CRO.**

**Part\*A**

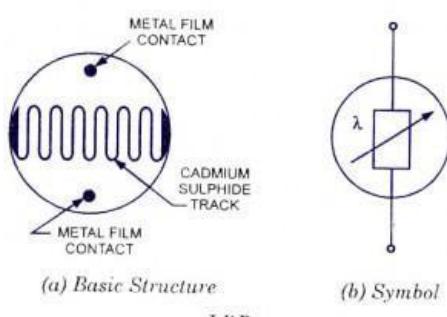
<b>Q.No</b>	<b>Question</b>
1.	<b>What is meant by Q-factor? (APR/MAY 2019)BTL1</b> Q-factor is known as the quality factor. It is used to measure the quality factor of the coils such as inductors, Capacitors etc
2.	<b>What is meant by Q-meter? BTL1</b> Q-meter is generally used to measure the Q-factor of the coil.
3.	<b>What are the various types of storage oscilloscopes? BTL1</b> The various types of storage oscilloscopes are <ul style="list-style-type: none"> <li>• Analog storageoscilloscope</li> <li>• Mesh storageoscilloscope</li> <li>• Bistable phosphor storageoscilloscope</li> <li>• Digital storageoscilloscope</li> </ul>
4.	<b>What is the DSO?(APR/MAY 2019)BTL1</b> DSO is known as digital storage oscilloscope, it is used for storing the waveform in a digital form. It consists of a sample and hold circuit, control logic and an A/D converter the waveform can be stored in a bufferamplifier
5.	<b>What are the various types o f Bridges? BTL1</b> Different types of bridges are shown below.

	<pre> graph TD     AC[A.C Bridge] --&gt; Maxwell[Maxwell's Bridge]     AC --&gt; Hay[Hay's Bridge]     AC --&gt; Schering[Schering's Bridge]     DC[D.C Bridge] --&gt; Wein[Wein Bridge]     DC --&gt; Andreson[Andreson's Bridge]     Wein --&gt; Kelvin[Kelvin's Bridge]     Wein --&gt; Wheatstone[Wheatstone Bridge]     Andreson --&gt; Kelvin     Andreson --&gt; Wheatstone   </pre>
6.	<p><b>What are the different types DVM? BTL1</b></p> <ul style="list-style-type: none"> <li>• Ramp typeDVM</li> <li>• Dual slope type integrating ty pe (voltage totime)</li> <li>• Integrating type DVM (voltage tofrequency)</li> <li>• Successive approximation ty pe(SAR)</li> </ul>
7.	<p><b>Write the working principle of Q-meter. BTL1</b></p> <p>The principle of Q-meter is based on series resonance. The voltage drop across the inductor or capacitor is Q times the applied voltage.</p>
8.	<p><b>What are the advantages of digital instruments? (APR/MAY 2019) BTL1</b></p> <ul style="list-style-type: none"> <li>• Readings speed is very high due to digitaldisplay.</li> <li>• They can be programmed and well suited for computerizedcontrol.</li> </ul>
9.	<p><b>Write the main static characteristics. BTL1</b></p> <p>The main staticcharact eristics are:</p> <ul style="list-style-type: none"> <li>• Accuracy</li> <li>• Sensitivity</li> <li>• Reproducibility</li> <li>• Drift</li> <li>• Static error</li> <li>• Dead zone</li> </ul>

	<ul style="list-style-type: none"> <li>• Resolution</li> <li>• Precision</li> <li>• Repeatability</li> <li>• Stability</li> </ul>
10.	<p><b>List the functional elements of the measurement systems. BTL1</b></p> <p>The three main functional elements of the measurement systems are:</p> <ul style="list-style-type: none"> <li>• Primary sensing element</li> <li>• Variable conversion element</li> <li>• Data presentation element</li> </ul>
11.	<p><b>Write the different types of systematic errors.(APR/MAY 2019)BTL1</b></p> <p>These types of errors are divided into three categories:</p> <ul style="list-style-type: none"> <li>• Instrument Errors</li> <li>• Environmental Errors</li> <li>• Observational Errors</li> </ul>
12.	<p><b>Define static error. BTL1</b></p> <p>Static error is defined as the difference between the true value and the measured value of the quantity.  <math display="block">\text{Static error} = A_t - A_m</math> Where  <math>A_m</math> = measured value of quantity <math>A_t</math> = true value of quantity</p>
13.	<p><b>What is primary sensing element? BTL1</b></p> <p>The primary sensing element is that which first receives energy from the measured medium and produces an output depending in some way on the measured quantity (measured).</p>

14.	<b>What is the importance of dynamic characteristic of systems? BTL1</b>  When the quantity under measurement changes rapidly with time, it is necessary to find the dynamic relations existing between input and output. These types of characteristics are called as Dynamic Characteristics.
-----	---

15.	<b>State the disadvantages of PMMC instruments. BTL1</b> <ul style="list-style-type: none"> <li>➤ Cannot be used for ac m/s.</li> <li>➤ Some errors are caused by temperaturevariations.</li> </ul>
16.	<b>Define inverse transducer with example. BTL1</b> <ul style="list-style-type: none"> <li>➤ An inverse transducer is defined as device which converts an electrical quantity into a non electrical quantity.</li> <li>➤ It is a precision actuator which has an electrical input and a low power non electrical output.</li> </ul>
17.	<b>Mention any 4 types of analog to digital converter. (APR/MAY 2019)BTL1</b> <ul style="list-style-type: none"> <li>➤ Flash type ofconverter</li> <li>➤ Staircaseconverter</li> <li>➤ Trackingconverter</li> <li>➤ Successive approximationtype</li> </ul>
18.	<b>Which torque is absence in energy meter? BTL3</b> The controlling torque is absence in energy metering energy meter continues rotation of disc is required & it is not necessary to reset it to zero every time & hence controlling torque is absence.
19.	<b>Define creeping.BTL1</b> Slow but continuous rotation of disc when pressure coil is energized and current coil c is not energized.
20.	<b>State the disadvantages of PMMC instruments. BTL4</b> <ul style="list-style-type: none"> <li>• Cannot be used for acm/s</li> <li>• Some errors are caused by temperaturevariations.</li> </ul>



**21. What is the principle of LDR? BTL1**

A Light Dependent Resistor (LDR) is also called a photo resistor or a cadmium sulfide (CdS) cell. It is also called a photoconductor. It is basically a photocell that works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases.

22.	<p><b>What is CRO? BTL1</b></p> <p>The <b>Cathode Ray Oscilloscope</b> is an instrument which we use in laboratory to display measure and analyze various waveforms of various <u>electrical circuit</u> and electronic circuits. Actually <b>cathode ray oscilloscope</b> is very fast X-Y plotters that can display an input signal versus time or other signal. Cathode ray oscilloscope uses luminous spot which is produced by striking the beam of electrons and this luminous spot moves in response variation in the input quantity.</p>
23.	<p><b>How do you classify transducers? (APR/MAY 2019) BTL2</b></p> <ul style="list-style-type: none"> <li>• On the basis of transduction form used. <ul style="list-style-type: none"> <li>◦ As primary and secondary transducers.</li> <li>◦ As active and passive transducers.</li> </ul> </li> <li>• As analog and digital transducers.</li> <li>• As transducers and inverse transducers.</li> </ul>
24.	<p><b>Define the primary and secondary transducers? BTL1</b></p> <p><b>Primary Transducer:</b> When the input signal is directly sensed by the transducer and physical phenomenon is converted into electrical form directly then such a transducer is called the primary transducer.</p> <p><b>Secondary Transducer:</b> When the input signal is sensed first by some detector or sensor and then its output being of some from other than input signals is given as input to a transducer for conversion into electrical form, then such a transducer falls in the category of secondary transducers.</p>
25.	<p><b>What are the advantages of digital storage oscilloscope? BTL2</b></p> <ul style="list-style-type: none"> <li>• It is easier to operate and has more capability.</li> <li>• The storage time is infinite.</li> <li>• The cursor measurement is possible.</li> </ul>
26.	<p><b>What are the factors to be considered for selection of transducers? BTL2</b></p> <ul style="list-style-type: none"> <li>• Environment conditions</li> <li>• Operating range</li> <li>• Sensitivity</li> <li>• Electrical characteristics</li> <li>• Accuracy</li> </ul>
27.	<p><b>What is piezo-electric effect? BTL2</b></p> <p>A Piezoelectric material is one in which an electric potential appears across certain surfaces of the crystals if the dimensions of the crystals are changed by the application of a mechanical force. This potential is produced by the displacement of charges. This effect is reversible. This phenomenon is known as piezoelectric effect.</p>

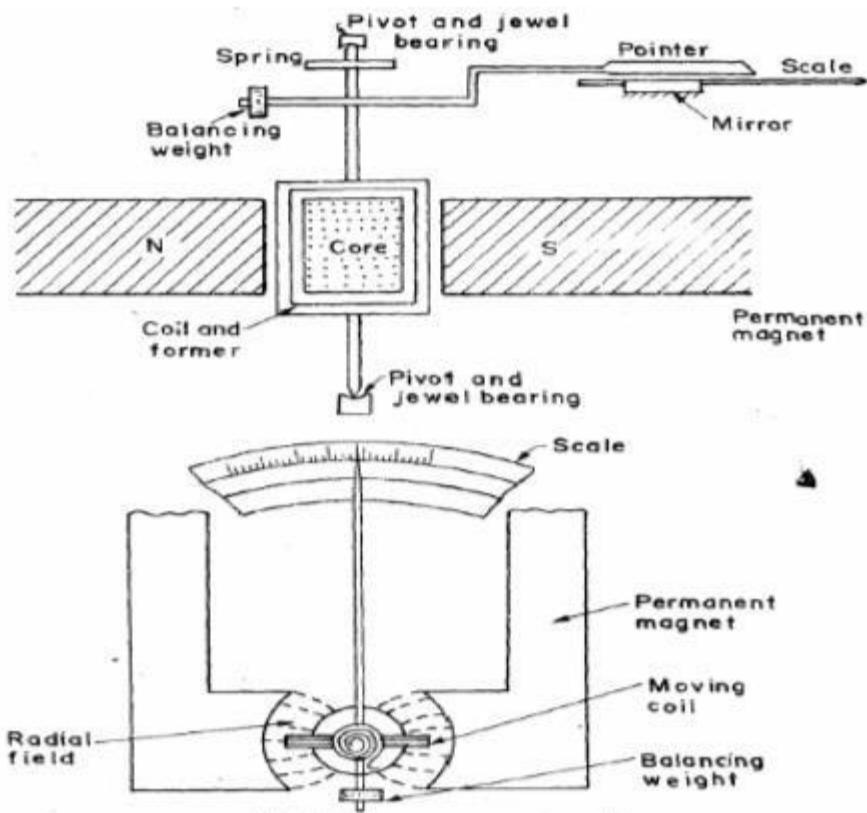
28.	<p><b>What is LVDT? List the advantages. BTL2</b></p> <p>It is a passive transducers which is used to measure the linear displacement into electrical signal voltage.</p> <ul style="list-style-type: none"><li>• High output</li><li>• High efficiency</li><li>• Low power consumption into electrical signal voltage</li></ul>
-----	--

29.	<p><b>List the types of strain gauge.BTL2</b></p> <ul style="list-style-type: none"> <li>• Bounded straingauge</li> <li>• Unbounded straingauge</li> <li>• Metallic straingauge</li> <li>• Foil type strain gauge</li> <li>• Semiconductor straingauge</li> </ul>
<b>PART B</b>	
Q.No	<b>Question</b>
1.	<p><b>Describe the static and dynamic characteristics of measuring instrument. (13M) (APR/MAY 2019)BTL2</b></p> <p><b>Answer: Page 9.1- Dr. C. Ramesh BabuDurai</b></p> <p><b>Static characteristics: (7M)</b></p> <ul style="list-style-type: none"> <li>• Accuracy: The closeness with which an instrument reading approaches the true value of the quantity being measured.</li> <li>• Precision: It is a measure of reproducibility of the measurements, i.e., given a fixed value of a quantity, precision is a measure of the degree of agreement with in a group of measurements.</li> <li>• Static sensitivity: If the input is slowly increased from some arbitrary (non-zero) input value, it will again be found that output does not change at all until a certain increment is exceeded.</li> <li>• Reproducibility: It is the degree of closeness with which a given value may be repeatedly measured. It may be specified in terms of units for a given period of time.</li> <li>• Drift: Gradual change in instrumentsmeasurements.</li> <li>• Static error: Numerical differences between true value of a quantity and its value as obtained by measurement.</li> <li>• Dead zone: It is defined as the largest change of input quantity for which there is no output of the instrument.</li> </ul> <p><b>Dynamic Characteristics: (6M)</b></p> <ul style="list-style-type: none"> <li>• Speed of response: The rapidity with which an instrument responds changes in measured quantity.</li> <li>• Measuring lag: The difference between the true and measured value with no staticerror.</li> <li>• Fidelity: Delay in the response of an instrument to changes in the measuredvariable.</li> <li>• Dynamic error: The degree to which an instrument indicates the changes in the measure variable without dynamic error (faithfulreproduction).</li> </ul>

2.	<b>Discuss in detail various types of errors associated in measurement and how these errors can be minimized?(13M) BTL3</b>
----	---

	<p><b>Answer: Page 9.15- Dr. C. Ramesh BabuDurai</b></p> <p><b>Error: (2M)</b></p> <p>The algebraic difference b/w the indicated value and the true value of the quantity to be measured is called an error.</p> <p><b>Types: (11M)</b></p> <ul style="list-style-type: none"> <li>• Static error: It is defined as the difference between the measured value and the true value of the quantity under measurement.</li> <li>• Gross errors: is due to human fault.</li> <li>• Systematic errors:           <ol style="list-style-type: none"> <li>1. Instrumental errors</li> <li>2. Environmental errors</li> <li>3. Observational errors</li> </ol> </li> <li>• Random errors: due to causes that cannot be directly established.</li> <li>• Hysteresis error: Hysteresis is a non-coincidence of loading and unloading curves. Hysteresis in a system arises due to the fact that all the energy put into the stressed parts when loading is not recoverable upon unloading.</li> </ul>
3.	<p><b>Describe the construction and working of permanent magnet moving coil instrument. Also derive the expression for deflection. (13M)(APR/MAY 2019)BTL3</b></p> <p><b>Answer: Page 9.12 - Dr. C. Ramesh BabuDurai</b></p> <p><b>Construction and working: (7M)</b></p>

JIT - 2106



A moving-coil meter is a very commonly used form of analogue voltmeter because of its sensitivity, accuracy and linear scale, although it only responds to d.c. signals. As shown schematically in Figure 6.2, it consists of a rectangular coil wound round a soft iron core that is suspended in the field of a permanent magnet. The signal being measured is applied to the coil and this produces a radial magnetic field. Interaction between this induced field and the field produced by the permanent magnet causes a torque, which results in rotation of the coil.

#### Torque equation: (4M)

Deflecting torque  $T_d = N B A I$    
 N=number of turns of coil

B= Flux density in air gap  $A =$   
 coil area

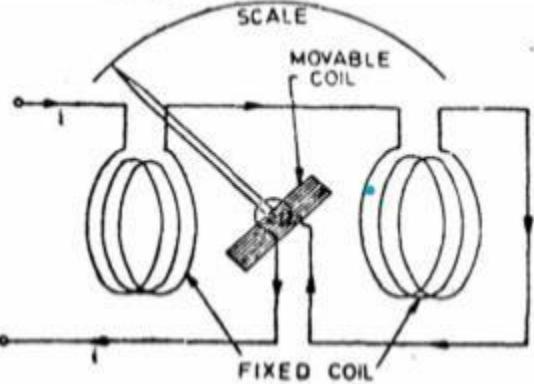
I= Current through moving coil Final  
 steady deflection  $T_c = T_d$

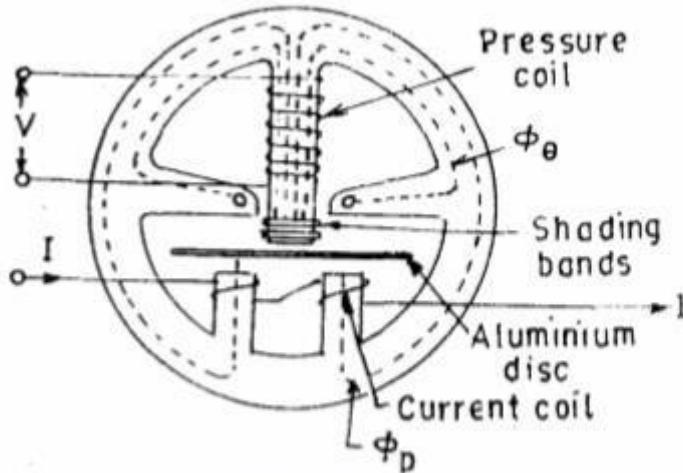
#### Advantages & disadvantages: (2M) Advantages:

- The sensitivity is high
- Uniform scale
- Operating current is small

#### Disadvantages:

- Not suitable for AC measurements

	<ul style="list-style-type: none"> <li>• Ageing of PMMC introduces the errors</li> <li>• Cost is high</li> </ul>
4.	<p><b>With a neat diagram explain the construction and working of electrodynamicometer type instruments. Also derive its torque equation. (13M) BTL2</b></p> <p><b>Answer: Page 9.28 - Dr. C. Ramesh Babu Durai</b></p> <ul style="list-style-type: none"> <li>• Circuit diagram (3M)</li> </ul>  <p>• Operating principle of Electro dynamo meter instruments(4M)</p> <p>• Torque equation(4M)</p> <p>• Advantages and disadvantages(2M)</p> <p><u>Adv</u></p> <ol style="list-style-type: none"> <li>1. As the coils are air cored, these instruments are free from hysteresis and eddy current losses.</li> <li>2. They have a precision grade accuracy for frequencies from 40 HZ to 500Hz.</li> </ol> <p><u>Dis-Adv</u></p> <ol style="list-style-type: none"> <li>1. They have a low torque/ weight ratio hence have a low sensitivity Increases frictional losses.</li> </ol>
5.	<p><b>Give the construction and principle of operation of single phase induction type energy meter. Also derive its torque equation. 13MBTL4</b></p> <p><b>Answer: Page 9.33 - Dr. C. Ramesh Babu Durai</b></p> <ul style="list-style-type: none"> <li>• Construction &amp; working of single phase energy meter(6M)</li> </ul>



(Fig) single phase energy meter

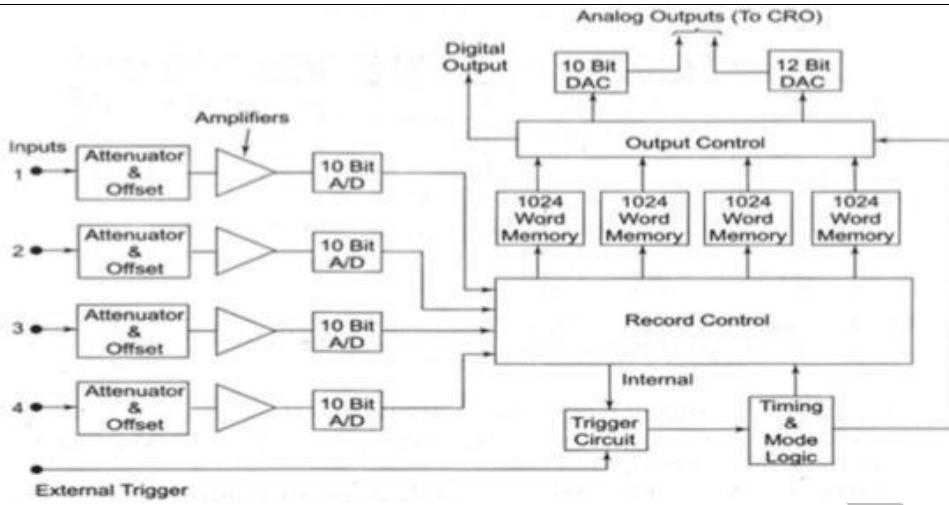
- **Explanation(4M)**

1. Drivingsystem
2. Movingsystem
3. Brakingsystem
4. Counting system/ Registeringmechanism

- **Errors caused by braking system & advantages(3M)**

6. Draw and explain the block diagram of digital CRO. (13M) BTL2  
**Answer:** Page 9.42 - Dr. C. Ramesh Babu Durai

- **Block diagram of digital CRO(7M)**

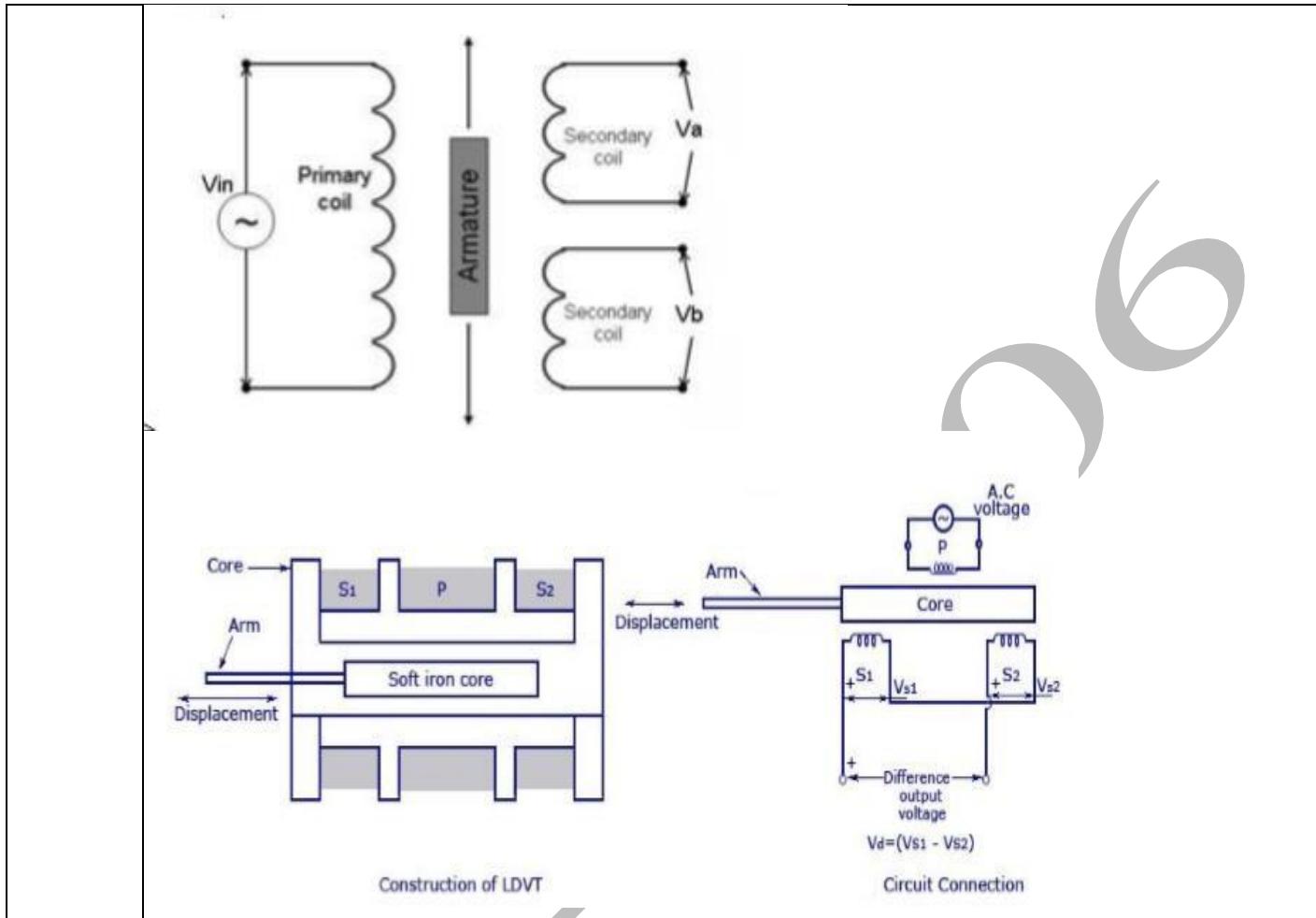


- **Working(6M)**

The input is amplified and attenuated with input amplifier as in any oscilloscope. The sample and hold circuit effectively snaps a picture of the voltage level. The output of S/H circuit is connected to an ADC. CRT accepts only the analog signals and thus the signal in the digital memory is converted in to an analog signal by means of digital to analog converter.

### Part\*C

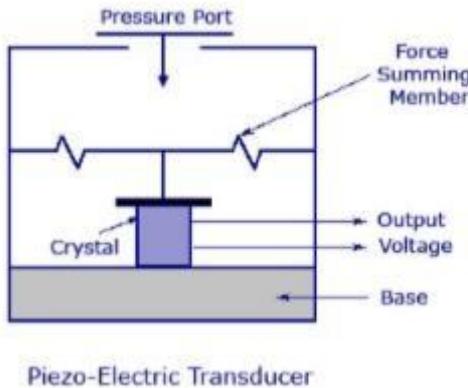
Q.No	Question
1.	<p><b>Explain the construction and working of LVDT with a neat sketch. (13M)(APR/MAY 2019)</b> BTL 2</p> <p><b>Answer: Page 9.52 - Dr. C. Ramesh BabuDurai</b></p> <ul style="list-style-type: none"> <li>• <b>Construction &amp; working of LVDT (6M &amp;7M)</b></li> <li>• An LVDT, or Linear Variable Differential Transformer, is a transducer that converts a linear displacement or position from a mechanical reference (or zero) into a proportional electrical signal containing phase (for direction) and amplitude information (for distance).</li> <li>• The LVDT operation does not require electrical contact between the moving part (probe or core rod assembly) and the transformer, but rather relies on electromagnetic coupling; this and the fact that they operate without any built-in electronic circuitry are the primary reasons why LVDTs have been widely used in applications where long life and high reliability under severe environments are required, suchas Military/Aerospace applications.</li> </ul>



2.	<p><b>Explain the principle of piezo electric transducers and name any two piezo electric materials. (15M) (APR/MAY 2018)BTL3</b></p> <p><b>Answer:</b> Page 9.55 - Dr. C. Ramesh BabuDurai</p> <ul style="list-style-type: none"> <li>• <b>Piezo electric diagram &amp; Principle of operation(10M)</b> <ol style="list-style-type: none"> <li>1. Piezoelectric transducers produce an output voltage when a force is applied to them. They are frequently used as ultrasonic receivers and also as displacement transducers, particularly as part of devices measuring acceleration, force and pressure.</li> <li>2. In ultra- sonic receivers, the sinusoidal amplitude variations in the ultrasound wave received are translated into sinusoidal changes in the amplitude of the force applied to the piezoelectrictransducer.</li> <li>3. In a similar way, the translational movement in a displacement transducer is caused by mechanical means to apply a force to the piezoelectrictransducer.</li> <li>4. Piezoelectric transducers are made from piezoelectric materials. These have an asymmetrical lattice of molecules that distorts when a mechanical force is applied to it.</li> <li>5. This distortion causes a reorientation of electric charges within the material, resulting in a relative displacement of positive and negativecharges.</li> <li>6. The charge displacement induces surface charges on the material of opposite polarity between the two sides. By implanting electrodes into the surface of the</li> </ol> </li> </ul>
----	--

material, these surface charges can be measured as an output voltage.

7. For a rectangular block of material, the induced voltage is given by:  $V = kFd/A$



- Modes of operation , advantages & dis-advantages(5M)

3. Explain different strain gauges with the principle of operation. (15M)BTL3

Answer: Page 9.49 - Dr. C. Ramesh BabuDurai

- Working principle(5M)
  1. A strain gauge is an example of a passive transducer that uses the variation in electrical resistances in wires to sense the strain produced by a force on the wires.
  2. If a metal conductor is stretched or compressed, its resistance changes on account of the fact that both length and diameter of conductor change.
- Theory and operating principle of resistance strain gauge derivation(10M)

4. Explain in detail about the different types of moving iron instruments.(15M)(APR/MAY 2019)BTL3

Answer: Page 9.16 - Dr. C. Ramesh BabuDurai

- Types(2M)
  1. Attraction type
  2. Repulsion type
- Explanation with diagram(10M)
- Torque equation(3M)