CONTENTS

Computer Fundamentals and Applications (CACS101) **1-52**

- New Syllabus 1
- TU Questions-Answers 2018 2
- TU Questions-Answers 2019 25
- Model Questions Sets For Practice

SET 1 ..... 37 SET 2 39
SET 3 ..... 41 SET 4 43
SET 5 ..... 44 SET 6 46
SET 7 ..... 47 SET 8 49
SET 9 51

English-I (CACS 103) **53-84**

- New Syllabus 53
- TU Questions-Answers 2018 55
- TU Questions-Answers 209 65
- Model Questions Sets For Practice

SET 1 ..... 75 SET 2 76
SET 3 ..... 77 SET 4 78
SET 5 ..... 80 SET 6 81
SET 7 ..... 82 SET 8 83

Mathematics-I (CAMT 104) **85-125**

- New Syllabus 85
- Model Questions-Answers 87
- TU Questions-Answers 2018 96
- TU Questions-Answers 2019 104
- Model Questions Sets For Practice

SET 1 ..... 111 SET 2 113
SET 3 ..... 114 SET 4 116
SET 5 ..... 118 SET 6 120
SET 7 ..... 121 SET 8 123
ANSWERS KEY 125

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Digital Logic (CACS 105) 126-183

- New Syllabus 126
- Model Questions-Answers 129
- TU Questions-Answers 2018 143
- TU Questions-Answers 2019 160
- Model Questions Sets For Practice

SET 1 ..... 171 SET 2 173
SET 3 ..... 174 SET 4 176
SET 5 ..... 178 SET 6 179
SET 7 ..... 181 SET 8 182

Society and Tehcnology (CACS 102) 184-208

- New Syllabus 184
- TU Questions-Answers 2018 186
- TU Questions-Answers 2019 196
- Model Questions Sets For Practice

SET 1 ..... 202 SET 2 203
SET 3 ..... 205 SET 4 206
SET 5 207

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5-183
.. 126
.. 129
. 143
. 160
173
176
179
82
8
4
5

Computer Fundamentals and Applications

New Syllabus

Course Title: Computer Fundamental and Applications
Course No: CACS101 — Full Marks: 60
Nature of the Course: Theory + Lab — Pass Marks: 24
Semester: I — Time: 3

Unit 1: Introduction to Computer System

Introduction to Computer, Characteristics of Computer, Applications of Computer, Classification of Computer, Mobile Computing, Anatomy of a Digital Computer, Computer Architecture, Memory & Its Classification, Input devices, Output Devices, Interfaces.

Unit 2: Computer Software

Introduction to Software, Types of Software, Program vs. Software, Computer Virus and Antivirus.

Unit 3: Operating System

Introduction to Operating System, Function of Operating System, Types of Operating System, Open Source Operating System.

Unit 4: Database Management System

Introduction to DBMS, Database Models, SQL, Database Design and Data Security, Data Warehouse, Data mining, Database Administrator.

Unit 5: Data Communication and Computer Network

Introduction to Communication system, Mode of Communication, Introduction to Computer Network, Types of Computer Network, LAN Topologies, Transmission Media, Network Devices, OSI Reference Model, Communication Protocols, Centralized vs. Distributed System.

Unit 6: Internet and WWW

Internet: Introduction to Internet and its Applications, Connecting to the Internet, Client/Server Technology, Internet as a Client/Server Technology, Email, Video-Conferencing, Internet Service Providers, Domain Name Server, Internet Address, Internet Protocols (IP, TCP, HTTP, FTP, SMTP, POP, Telnet, Gopher, WAIS), Introduction to Intranet, Internet vs. Intranet vs. Extranet, Advantages and Disadvantages of Intranet

World Wide Web (WWW): World Wide Web and its Evolution, Architecture of Web, Uniform Resource Locator (URL), Browsers: Internet Explorer, Netscape Navigator, Opera, Firefox, Chrome, Mozilla; Search Engine, Web servers: Apache, IIS, Proxy Server, JTTP Protocol, FTP Protocol.

Unit 7: Contemporary Technologies

Multimedia, E-Commerce, E-Learning, E-Governance, E-Banking, Hypermedia, Geographical Information System, Virtual Reality, Augmented Reality, Artificial Intelligence, Ambient Intelligence, Robotics, Bit Coin.

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TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

TU QUESTIONS-ANSWERS 2018

Course Title: Computer Fundamental and Applications — Full Marks: 60
Course No: CACS101 — Pass Marks: 24
Nature of the Course: Theory + Lab — Time: 3
Semester: I

Group – A

Attempt all the questions **[10 x1=10]**

1. **Circle (O) the correct answer in the following questions**

i. Which one of the following is not the characteristic of Computer?
a) Diligence b) Versatile c) Intelligence d) Reliable

ii. Which one of the following is the utility software?
a) Skype b) Windows Defender
c) MS – Paint d) Adobe Photoshop

iii. Which one of the following is not the type of Operating System?
a) Hierarchical b) Network c) Batch d) Multiprogramming

iv. Which one of the following is not the attribute of information?
a) Accuracy b) Redundancy c) Relevancy d) Timeliness

v. Which one of the following does not belongs to OSI reference model?
a) Network Administrator b) Internet Protocol (IP)
c) Data link Layer d) Data Presentation

vi. Who invented WWW?
a) Sundar Pichai b) Tim Berners-Lee
c) Bill Gates d) Steve Jobs

vii. Which one of the following is crypto currency?
a) Payment Gateway b) PayPal
c) Dollar d) Bit coin

viii. Which one of the following belongs to LMS?
a) e-Commerce b) e-Governance c) e-Banking d) e-Learning

ix. Which one of the following is the characteristic of DOS?
a) 32– bit Operating System b) 16 –bit operating System
c) Server Operating System d) WIMP

x. Which one of the following is not the graphical File Format?
a) PNG b) BMP c) TIFF d) PPT

Answer-Key

i. (d)	ii. (b)	iii. (a)	iv. (b)	v. (a)	vi. (b)	vii. (d)	viii. (d)	ix. (b)	x. (d)

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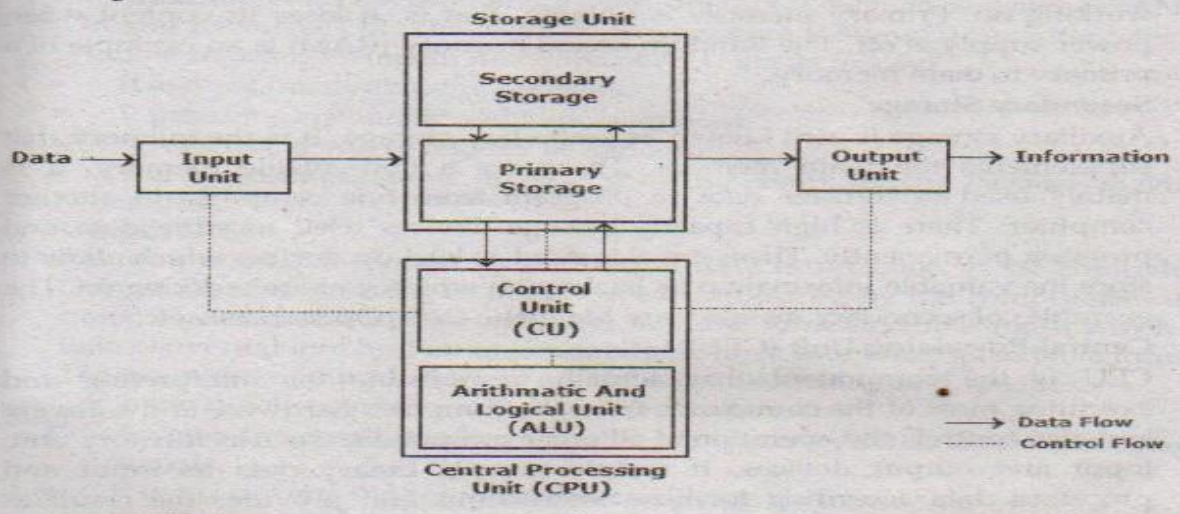
Group– B

Attempt any SIX questions **[6x5 =30]**

2. **What do you mean by Computer Architecture? Describe the functional components of computer architecture with block diagram.**

Ans: Computer Architecture is the science and art of selecting and interconnecting hardware components to create computers that meet functional, performance and cost goals. Computer architecture refers to software standards, hardware instructions and technology infrastructure that define how computer systems, platforms and programs operate. In other words, computer architecture outlines the system's design, functionality and compatibility. Creating a computer's architecture requires IT professionals to first determine the needs of users, technology limitations and process requirements.



Input Unit

The input unit is formed by the input devices attached to the computer. Input devices are used to interact with a computer system or used enter data and instructions to the computer. These devices convert input data and instructions into a suitable binary form such as ASCII, which can be acceptable by the computer. E.g. of input devices is keyboard, mouse, scanner etc. It performs the following function:

- It accepts data and instruction from the outside worlds.
- It converts these data and instruction into computer understandable from a binary form.
- It supplied the converted data and instruction to the computer system for further processing.

Memory Unit

This unit is also called storage unit. The data and instructions, which are entered through an input unit, must be stored on the computer before the actual processing starts. The result produces by the computer after processing is also kept somewhere before passed to the output units. If intermediate results are produced during processing, it should be stored in somewhere in memory. The storage unit of a computer performs all these

needs. In brief, the specific functions performed by the storage unit are as follow:

- It stored data and instructions, which are entered through input devices.
- It stores an intermediate result of processing.
- It stores the final result of processing before these results are passed to an output device.

The storage unit of computers consists of two types of memory or storage: primary and secondary storage.

Primary Storage

Memory storage that communicates directly with CPU is called main memory. It enables the computer to store, at least temporarily data and instruction. It is mainly used to hold data and instructions and as well as the intermediate result of processing which the computer system is currently working on. Primary memory is volatile, that is, it loses its content when power supply is off. The Random access memory (RAM) is an example of a primary to main memory.

Secondary Storage

Auxiliary storage is also known as secondary storage. It is the memory that supplements the main memory. These are a non-volatile memory. It is mainly used to transfer data to program from one computer to another computer. There is high capacity storage devices used to store data and program permanently. These are also used as backup devices which allow to store the valuable information as backup on which you are working on. The examples of secondary memory are Magnetic Disk, Optical disk, etc.

Central Processing Unit (CPU)

CPU is the component that actually responsible for interpreting and executing most of the commands from the computer hardware and software and also controls the operation of all other components such as memory unit, input and output devices. It simply accepts binary data as input and processes data according to those instructions and provides the result as output. It is the logic machine. So, its main function is run the program by fetching instructions from the RAM, evaluating and executing them in sequence. In summary, the functions of CPU are as follow:

- Read instruction from memory
- Communicate with all peripherals using the system bus.
- It controls the sequence of instructions.
- It controls the flow of data from one component to another component.
- Performs the computing task specified in the program.

Control Unit

The control unit provides the necessary timing and control signals to all the operations on the computer. It controls the flow of data between the CPU, memory and peripherals. It also controls the entire operation of a computer. It obtains the instructions from the program stored in the main memory, interprets the instructions and issues the signals, which cause the other units of the system to execute them. So, it is considered as a central nervous system of a computer that provides status, control and timing signals necessary for the operation of other parts of CPU, memory and I/O devices. The main functions of control units are given below:

- It performs the data processing operations with the aid of program prepared by the user and send control signals to various parts of the computer system.
- It gives commands to transfer data from the input devices to the memory to an arithmetic logic unit.
- It also transfers the results from ALU to the memory and then to the output devices.
- It stores a program in the memory.
- It fetches the required instruction from the main storage and decode each instruction and hence execute them in sequence.

Arithmetic Logic Unit

This is the area of CPU where various computing functions are performed on data. The ALU performs arithmetic operations such as addition, subtraction, multiplication and division and logical operation such as comparison AND, OR and Exclusive OR. The result of an operation is stored in Accumulator or in some register. The main functions of ALU are as follow:

- It accepts operands from registers.
- It performs arithmetic and logic operations.
- It returns a result to register or a memory.
- The logical operations of ALU give the computer the decision-making ability.

Output Unit

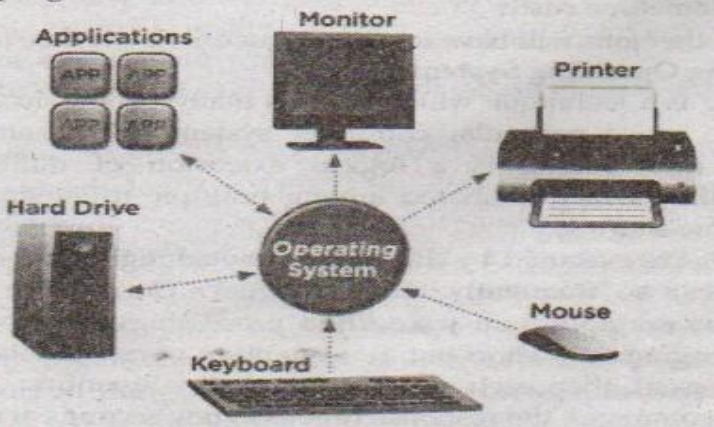
The output unit is formed by the output devices attached to the computer. Output devices are used to present result produced by the computer to the users. The output from the computer is in the form electric signals, which is then converted into human understandable form into human readable form. The examples of output devices are the monitor, printer and speaker.

The main functions of the output unit are as follow:

- Accepts the result produced by the computer which is in electric binary signals.
- It then converts the result into human readable form.
- Finally, it supplied the converted results to the outside word.

3. **Define Operating System. Explain the types of operating system with their examples.**

Ans: An operating system (OS) is system software that manages computer hardware and software resources and provides common services for computer programs.



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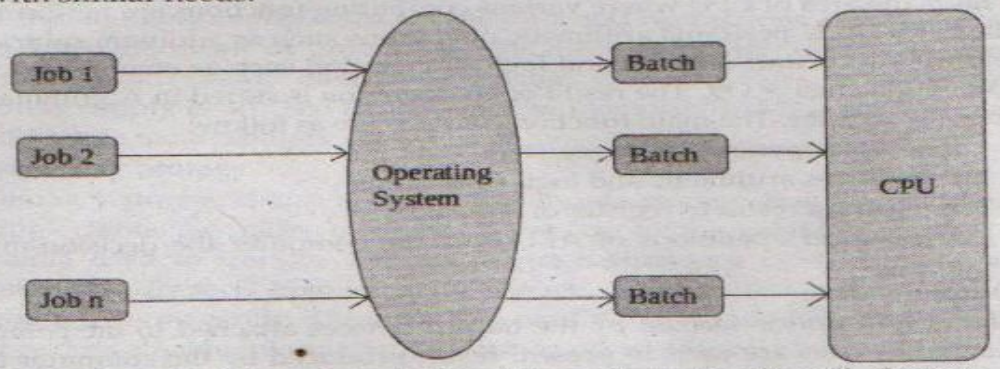
An Operating System performs all the basic tasks like managing file, process, and memory. Thus operating system acts as manager of all the resources, i.e. resource manager. Thus operating system becomes an interface between user and machine.

Types of Operating Systems

Some of the widely used operating systems are as follows:

1. **Batch Operating System**

This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having same requirement and group them into batches. It is the responsibility of operator to sort the jobs with similar needs.



Examples of Batch based Operating System: Payroll System, Bank Statements etc.

Advantages of Batch Operating System:

- It is very difficult to guess or know the time required by any job to complete. Processors of the batch systems knows how long the job would be when it is in queue
- Multiple users can share the batch systems
- The idle time batch system is very less
- It is easy to manage large work repeatedly in batch systems

Disadvantages of Batch Operating System:

- The computer operators should be well known with batch systems
- Batch systems are hard to debug
- It is sometime costly
- The other jobs will have to wait for an unknown time if any job fails

2. **Time-Sharing Operating Systems**

Time-sharing is a technique which enables many people, located at various terminals, to use a particular computer system at the same time. Time-sharing or multitasking is a logical extension of multiprogramming. Processor's time which is shared among multiple users simultaneously is termed as time-sharing.

Multiple jobs are executed by the CPU by switching between them, but the switches occur so frequently. Thus, the user can receive an immediate response. **For example**, in a transaction processing, the processor executes each user program in a short burst or quantum of computation. That is, if n users are present, then each user can get a time quantum. When the user submits the command, the response time is in few seconds at most.

3. **Distributed operating System**

Distributed systems use multiple central processors to serve multiple real-time applications and multiple users. Data processing jobs are distributed among the processors accordingly. The processors communicate with one another through various communication lines (such as high-speed buses or telephone lines). These are referred as loosely coupled systems or distributed systems. Processors in a distributed system may vary in size and function. These processors are referred as sites, nodes, computers, and so on.

4. **Network operating System**

A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking functions. The primary purpose of the network operating system is to allow shared file and printer access among multiple computers in a network, typically a local area network (LAN), a private network or to other networks. Examples of network operating systems include Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD.

5. **Real Time operating System**

A real-time system is defined as a data processing system in which the time interval required to process and respond to inputs is so small that it controls the environment. The time taken by the system to respond to an input and display of required updated information is termed as the response time. So in this method, the response time is very less as compared to online processing. A real-time operating system must have well-defined, fixed time constraints, otherwise the system will fail. For example, scientific experiments, medical image systems, industrial control systems, weapon systems, robots, air traffic control systems, etc.

There are two types of real-time operating systems:

5.1 **Hard real-time systems**

Hard real-time systems guarantee that critical tasks complete on time. In hard real-time systems, secondary storage is limited or missing and the data is stored in ROM. In these systems, virtual memory is almost never found.

5.2 **Soft real-time systems**

Soft real-time systems are less restrictive. A critical real-time task gets priority over other tasks and retains the priority until it completes. Soft real-time systems have limited utility than hard real-time systems. For example, multimedia, virtual reality, Advanced Scientific Projects likes undersea exploration and planetary rovers, etc.

4. **Define DBMS. Explain the different database models with their merits and demerits.**

Ans: A database management system (DBMS) is system software for creating and managing databases. The DBMS provides users and programmers with a systematic way to create, retrieve, update and manage data.

A DBMS makes it possible for end users to create, read, update and delete data in a database. The DBMS essentially serves as an interface between the database and end users or application programs, ensuring that data is consistently organized and remains easily accessible. The DBMS manages three important things: the data, the database engine that allows data to be accessed, locked and modified -- and the database schema, which defines the

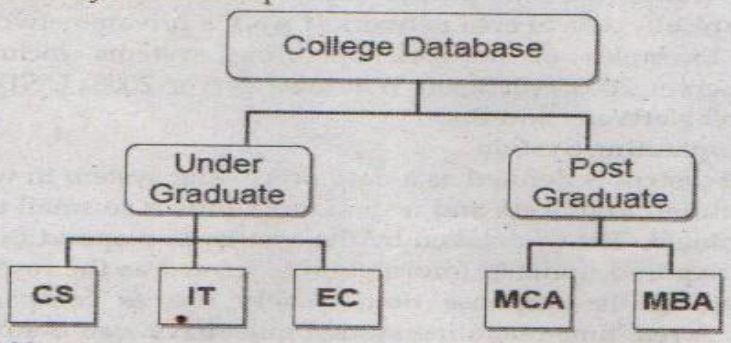
database's logical structure. These three foundational elements help provide concurrency, security, data integrity and uniform administration procedures.

Types of Data Models

Data Models are the collection of concept to describe the structure of database. The types of data models are:

Hierarchical Database Model

This is the oldest form of database. This data model organizes the data in the tree structure i.e. each child node can have only one parent node and at the top of the structure, there is a single parenthesis node. In this model a database record is a tree that consists of one or more groupings of fields called segments, which makeup the individual nodes of the tree. This model use one-to-many relationship



Advantages

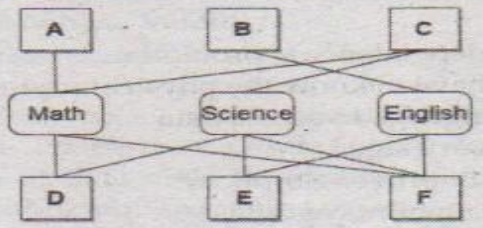
- Have many different structures and forms
- Structures data in an upside-down tree (Simplifies data overview)
- Manages large amounts of data
- Express the relationships between information
- Many children per parent
- Distribute data in terms of relationships
- Improve data sharing

Disadvantages

- One parent per child.
- Complex (users require physical representation of database)
- Navigation system is complex
- Data must be organized in a hierarchical way without compromising the information
- Lack structural independence
- Many too many relationships not supported
- Data independence

Network Database Model

The Network database model was developed as an alternative to the hierarchical database. This model expands on the hierarchical model by providing multiple paths among segments i.e. more than one parent-child relationship. Hence this model allows one-to-one, one-to-many and many-to-many relationships.



Advantages

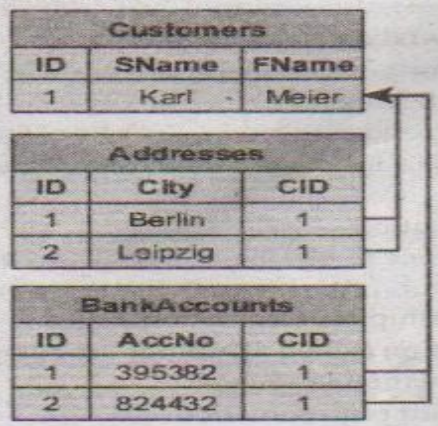
- **Conceptual simplicity:** Just like the hierarchical model, the network model is also conceptually simple and easy to design.
- **Capability to handle more relationship types:** The network model can handle the one to many and many to many relationships which is real help in modeling the real life situations.
- **Ease of data access:** The data access is easier and flexible than the hierarchical model.
- **Data integrity:** The network model does not allow a member to exist without an owner.
- **Data independence:** The network model is better than the hierarchical model in isolating the programs from the complex physical storage details.

Disadvantage

- **System complexity:** All the records are maintained using pointers and hence the whole database structure becomes very complex.
- **Operational Anomalies:** The insertion, deletion and updating operations of any record require large number of pointers adjustments.
- **Absence of structural independence:** structural changes to the database are very difficult.

Relational Database Model

The key differences between previous database models and relational database model is in terms of flexibility. A relational database represents all data in the database as simple two-dimensional tables called relations. Each row of a relational table, called tuple, represents a data entity with columns of the table representing attributes (fields). The allowable values for these attributes are called the domain. Each row in a relational table must have a unique primary key and also has some secondary keys which correspond with primary keys in other tables



Customers

ID	SName	FName
1	Karl	Meier

Addresses

ID	City	CID
1	Berlin	1
2	Leipzig	1

BankAccounts

ID	AccNo	CID
1	395382	1
2	824432	1

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Advantages

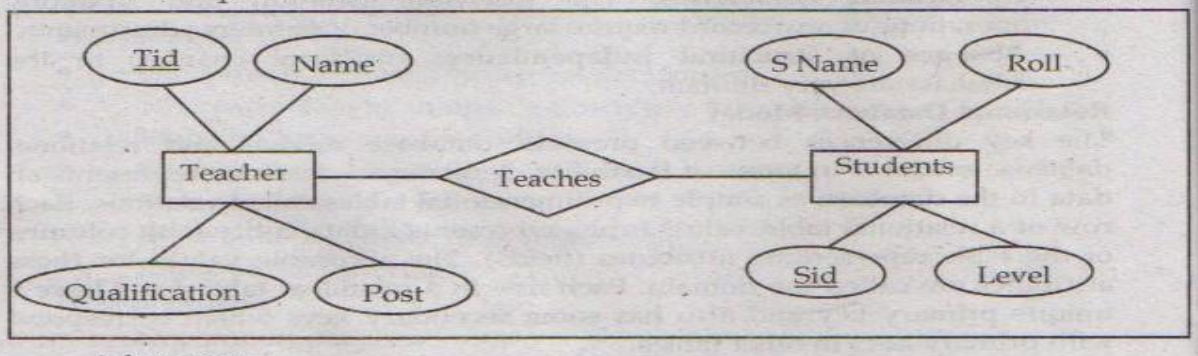
- Structured independence is promoted
- Users do not have to know the physical representation of the database
- Use of SQL language to access data
- Easier database design
- Tabular view improves simplicity
- Support large amounts of data
- Data independence
- Multi-level relationships between data sets
- No need to predefined data relationships

Disadvantages

- Data anomalies
- People need training if they want to use the system effectively and efficiently.

Entity Relationship Data Model

Dr. Peter Pin-Shan Chen introduced the entity relationship data model in 1976. It is a graphical representation of entities that became popular very quickly because it complemented the relational database model concepts. An entity relationship diagram (ERD), also known as an entity relationship model, is a graphical representation of an information system that depicts the relationships among people, objects, places, concepts or events within that system. An ERD is a data modeling technique that can help define business processes and be used as the foundation for a relational database.



Advantages

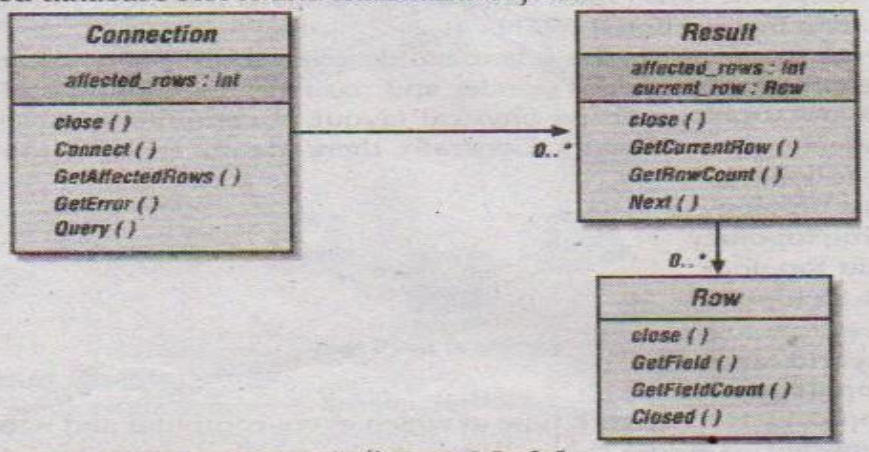
- A very important data modeling tool
- An extended Entity-Relationship diagram allows more details
- Multi-valued attributes
- Structured independence
- Organize the data into categories defining entities & the relationships between them
- Visual representation
- Data independence

Disadvantages

- Limited relationship representation
- Loss of information (when attributes are removed from entities)
- No data manipulation language
- Limited constraint representation

Object-Oriented Database Model

The relational database model has a widely variety of applications. However it does not easily support the distribution of one database across a number of servers. Due to this, object-oriented database management system was developed. In these databases, the users can define own data access methods, the representation of data and the method of manipulating it. An object-oriented database stores and maintains objects.



Advantages of Object Oriented Data Model

- Add semantic content
- Visual presentation includes semantic content
- Database integrity
- Both structural and data independence

Disadvantages of Object Oriented Data Model

- Lack of OODM standards
- Complex navigational data access
- Steep learning curve
- High system overhead slows transaction

5. **Define Computer Network. Explain the different types LAN topologies with their advantages and disadvantages.**

Ans: A computer network is a set of connected computers. Computers on a network are called nodes. The connection between computers can be done via cabling, most commonly the Ethernet cable, or wirelessly through radio waves. Connected computers can share resources, like access to the Internet, printers, file servers, and others. A network is a multipurpose connection, which allows a single computer to do more.

We need a computer networks for the following purposes, they are as:

- **File sharing:** Networking of computers helps the network users to share data files.
- **Hardware sharing:** Users can share devices such as printers, scanners, CD-ROM drives, hard drives etc. Without computer networks, device sharing is not possible.
- **Application sharing:** Applications can be shared over the network, and this allows implementing client/server applications.

- **User communication:** Networks allow users to communicate using e-mail, newsgroups, and video conferencing etc.
- **Network gaming:** A lot of network games are available, which allow multi-users to play from different locations.
- **Voice over IP (VoIP):** Voice over Internet Protocol (IP) is a revolutionary change in telecommunication which allows to send telephone calls (voice data) using standard Internet Protocol (IP) rather than by traditional PSTN.

Network Topology is the schematic description of a network arrangement, connecting various nodes (sender and receiver) through lines of connection. A network topology is the physical layout of computers, cables, and other components on a network. Generally there are six types of topology. They are as follows

- Bus topology
- Ring topology
- Star topology
- Mesh topology
- Tree topology
- Hybrid topology

Bus topology

Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called Linear Bus topology. The terminator is used to absorb the signal when the signal reaches the end, preventing signal bounce. When using bus topology, when a computer sends out a signal, the signal travels the cable length in both directions from the sending computer. When the signal reaches the end of the cable length, it bounces back and returns in the direction it came from. This is known as signal bounce. Signal bounce will create problem in the network, because if another signal is sent on the cable length at the same time, the two signals will collide.

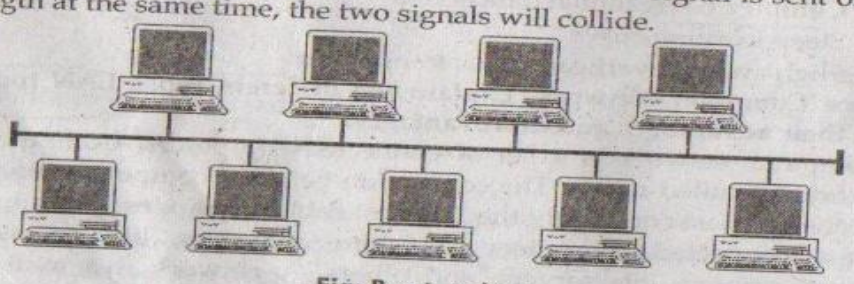


Fig: Bus topology

Merits of Bus topology

- It is cost effective
- Cable required is least compared to other network topology
- Used in small networks
- It is easy to understand
- Easy to expand joining two cables together

Demerits of Bus topology

- Cables fails then whole network fails
- If network traffic is heavy or nodes are more the performance of the network decreases

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- Cable has a limited length
- It is slower than the ring topology

Ring topology

Ring topology refers to a specific kind of network setup in which devices are connected in a ring and pass information from each other according to their adjacent proximity in the ring structure. It sends data in uni-directional form.

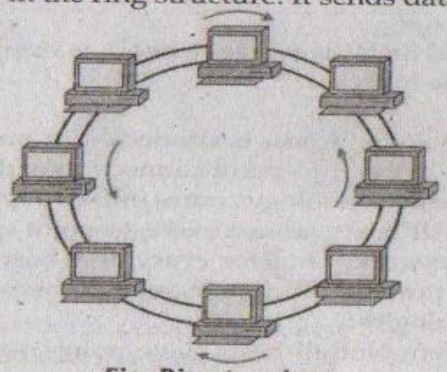

Fig: Ring topology

Merits of Ring topology

- Small cable segments are needed to connect two nodes
- Very high transmission speeds possible

Demerit of Ring topology

- Troubleshooting is difficult in ring topology
- Adding or deleting the computers disturbs the network activity.
- Failure of one computer disturbs the whole network

Star topology

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node. In this topology every node has its own dedicated connection to the hub and hub acts as a repeater for data flow. It is used with twisted pair cable, optical fiber cable or coaxial cable.

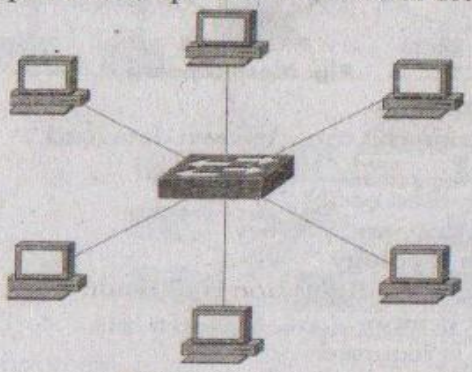

Fig: Star topology

Merits of Star topology

- Fast performance with few nodes and low network traffic
- Hub can be upgraded easily

- Easy to troubleshoot
- Easy to setup and modify
- Only that node is affected which has failed, rest of the nodes can work smoothly.

Demerits of Star topology

- Cost of installation is high
- Expensive to use
- If the hub fails then the whole network is stopped because all the nodes depend on the hub

Mesh topology

In this type of topology, a host is connected to one or multiple hosts. This topology has hosts in point-to-point connection with every other host or may also have hosts. Mesh technology comes into two types. They are as follows:

- **Full Mesh**: All hosts have a point-to-point connection to every other host in the network. Thus for every new host n(n-1)/2 connections are required. It provides the most reliable network structure among all network topologies.
- **Partially Mesh**: Not all hosts have point-to-point connection to every other host. Hosts connect to each other in some arbitrarily fashion. This topology exists where we need to provide reliability to some hosts out of all.

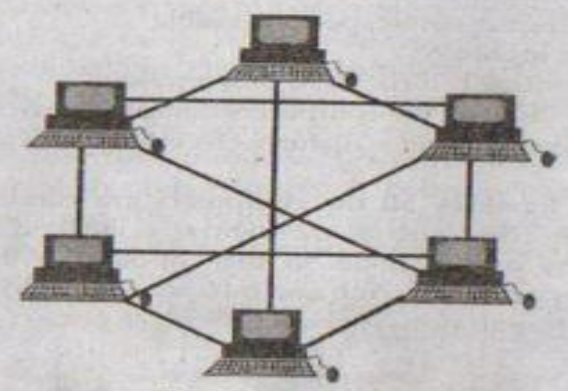

Fig: Mesh topology

Merits of Mesh topology

- Each connection can carry its own data load
- It is robust
- Fault is diagnosed easily
- Provides security and privacy

Demerits of Mesh topology

- Installation and configuration is difficult.
- Cabling cost is more
- Bulk wiring is required

Tree topology

Tree topology has a group of star networks connected to a linear bus backbone cable. It incorporates features of both star and bus topologies. Tree topology is also called hierarchical topology. It should at least have three levels to the hierarchy.

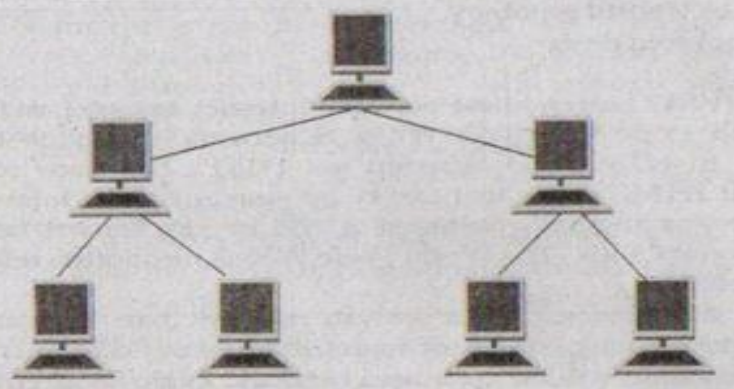

Fig: Tree topology

Merits of Tree topology

- Extension of bus and star topologies
- Expansion of nodes is possible and easy
- Easily managed and maintained
- Error detection is easily done

Demerits of Tree topology

- Heavily cabled
- Costly
- If more nodes are added maintenance is difficult
- Central hub fails, network fails

Hybrid topology

Hybrid topology is an integration of two or more different topologies to form a resultant topology. It inherits merits and demerits of all the incorporating topologies.

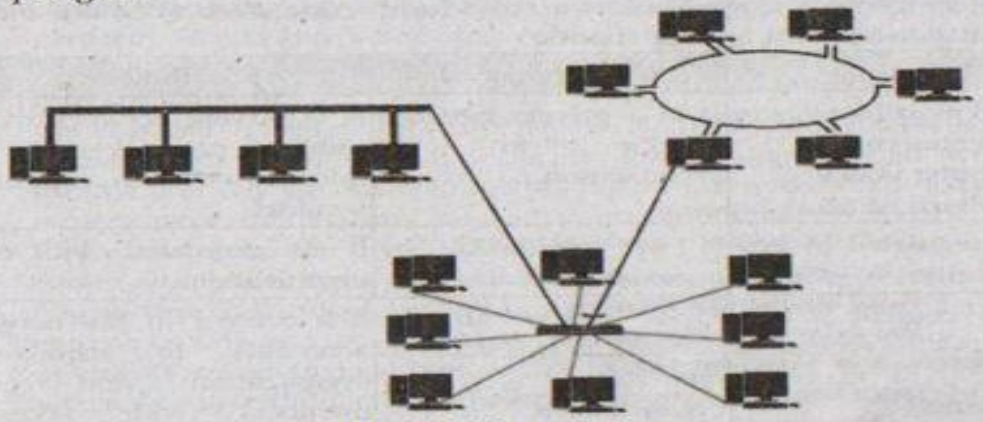

Fig: Hybrid topology.

Merits of Hybrid topology

- Reliable as Error detecting and trouble shooting is easy
- Effective
- Scalable as size can be increased easily
- Flexible

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Demerits of Hybrid topology

- Complex in design
- Costly

6. What is WWW? Differentiate between intranet, extranet and internet.

Ans: The World Wide Web (WWW) is a network of online content that is formatted in HTML and accessed via HTTP. The term refers to all the interlinked HTML pages that can be accessed over the Internet. The World Wide Web was originally designed in 1991 by Tim Berners-Lee while he was a contractor at CERN. The World Wide Web is most often referred to simply as "the Web."

Intranet: An intranet is a private network that is contained within an enterprise. It may consist of many interlinked local area networks and also use leased lines in the wide area network. Typically, an intranet includes connections through one or more gateway computers to the outside Internet. The main purpose of an intranet is to share company information and computing resources among employees. An intranet can also be used to facilitate working in groups and for teleconferences.

Extranet: Extranet refers to network within an organization, using internet to connect to the outsiders in controlled manner. It helps to connect businesses with their customers and suppliers and therefore allows working in a collaborative manner. Extranet is implemented as a Virtual Private Networks (VPN) because it uses internet to connect to corporate organization and there is always a threat to information security. VPN offers a secure network in public infrastructure (Internet).

Internet: A global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols. The Internet carries a vast range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (WWW), electronic mail, telephony, and file sharing.

Internet	Intranet	Extranet
It is a global system of interconnected computer network.	It is a private network specific to an organization.	It is private network that uses public network to share information with supplies and vendors.
Not regulated by any authority.	It is regulated by organizations.	It is regulated by multiple organizations.
Thus content in the network is accessible to everyone connected.	Thus content in the network is accessible to members of organizations.	The content in the network is accessible to members of organization and external members with access to network.
It is largest in terms of number pf connected devices.	It is small network with minimal number pf connected devices.	The number of devices connected is comparable with intranet.
It is owned by no one.	It is owned by single organizations.	It is owned by single or multiple organizations.

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It is means of sharing information throughout the world.	It is means of sharing sensitive information throughout organization.	It is means of sharing information between members and external members.
Users can access internet anonymously.	Users should have valid username/ password to access intranet.	Users should have valid username/password to access extranet.
Internet is unregulated and uncensored.	Intranet is regulated by the organization policies.	Extranet is also regulated by contractual agreements between organizations.

In brief their examples are listed below:

Type	Definition	Example
Internet	a global, public TCP/IP network used by over a billion people	Sending email to a friend
Intranet	a TCP/IP network with access restricted to members or employees of a single organization	Accessing your record in the employee personnel file
Extranet	a TCP/IP network with access restricted to members or employees of a two or more organizations	Checking availability of inventory from an outside supplier

7. What is e-Commerce? Explain its role to enhance the country's economy.

Ans: E-commerce is a type of business model that focuses on doing commercial transactions through electronic networks such as the Internet. E-commerce stands for electronic commerce. In simply the definition of e-Commerce is the act of buying or selling goods and services over the internet.

E-commerce examples

- **Online shopping**
  Online Shopping occurs when a customer buys through a digital platform. If you buy something online from, for example, retail giant Amazon, you are online shopping.
- **Internet Banking**
  We also call it online banking. Nearly all banks today offer services through their website. We can transfer money, apply for an overdraft facility, and pay off our credit cards online. An overdraft facility is an arrangement with the bank in which your account may be in debit.
- **Electronic payments**
  Some companies have an online electronic payments service which allows you to perform transactions digitally. They say their service is extremely safe and effective. Pay Pal, for example, is a global online payments system that supports online money transfers. It is an electronic alternative to traditional paper methods like money orders and checks
- **Online Auctions**
  People can place bids and acquire products at competitive prices online.

Role of e-commerce to enhance the country's economy:

In the new economy, knowledge and information have become the main production factor. In this context, innovation and technical progress have a major contribution to the durable economic development. The electronic commerce is the key for enterprises competitivity in this informational era,

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insuring the access to new market segments, increasing the speed of developing business, the increased flexibility of commercial policies, decreasing the provisioning sale and advertising costs, simplifying the procedures etc. The impact of the electronic commerce upon the companies and upon society will be of great importance both as extent and as intensity.

E-commerce is one such activity that has generated new dimensions in economic growth and that has a potential to add a higher value to businesses and consumers. In view of the fact that the emergence of e-commerce is the most important development since the industrial revolution, this study examines the role of e-commerce as the most important factors that will revolutionize economic growth.

8. **Write the DOS commands to complete following tasks:**

a) **Create sub directory BCA, BIM, BSC inside d:\TU**

d:/TU/md "BCA, BIM, BSC"

b) **Create the file name *bcainfo.txt* inside BCA having the content, "BCA is professional degree".**

c:/copy con bcainfo.txt

BCA is professional degree

Press f6 then hit enter to save the contain inside the file "bcainfo.txt"

c) **Rename the file name *bcainfo.txt* with *myinfo.txt*.**

c:/rename bcainfo.txt myinfo.txt

d) **Make hidden the file *myinfo.txt***

c:/attrib +h myinfo.txt

e) **Format the pen drive which is installed as g:\in your computer.**

c:/user/bhupi/format g:

OR

DISKPART> list disk

DISKPART> select disk

DISKPART> clean

DISKPART> create partition primary

DISKPART> format fs=ntfs

DISKPART> assign

Group – C

Attempt any TWO questions. **[2 x10 =20]**

9. i) **You are provided following data: .**

Churiya Mai Secondary School

Hetauda

Mark-ledger

	A	B	C	D	E	F	G	H	I	J
1	Name	English	Nepali	Education	Math	Computer	Total	Percentage	Result	Division
2	Sarita	67	45	65	76	66				
3	Gita	78	34	64	67	76				
4	Shya	87	56	67	65	61				
5	Ram	76	64	56	72	82				
6	Bindu	79	46	63	58	56				

Write the formula in spread sheet package to solve the following problems:

a. **Calculate Total marks** [1]
=SUM(B2:F2)

b. Calculate **Percentage** [1]
=G2/5

c. **Mark the student with either "PASS" or "FAIL" [Pass mark 35]** [1.5]
=IF(AND(B2>=35, C2>=35,D2>=35,E2>=35,F2>=35),"Pass", "Fail")

d. **Calculate the division [if percentage >=60 then First, if percentage >=45 and percentage < 60 then Second, if percentage >=35 and percentage <45 then Third otherwise "xxx"]** [1.5]
=IF(H2>=60,"First",IF(AND(H2<60,H2>=45),"Second",IF(AND(H2<45,H2>=35),"Third","XXX")))

Name	Eng	Nepali	Edu	Math	Computer	Total	%	Result	Division
Sarita	67	45	65	76	66	319	63.8	Pass	First
Gita	78	34	64	67	76	319	63.8	Fail	First
Shyam	87	56	67	65	61	336	67.2	Pass	First
Ram	76	64	56	72	82	350	70	Pass	First
Bindu	79	46	63	58	56	302	60.4	Pass	First

ii). Explain the features of Font control dialog box in word [5]

Ans: The Font tab in the Word 2007 Font dialog box contains many commands for formatting text, including some that you can't access from the Font group on the Home tab. For example, you can also add effects such as shadows and embossing, and preview the results before you apply them. The Font Tab offers features that are not available in the Font group of the Home tab:

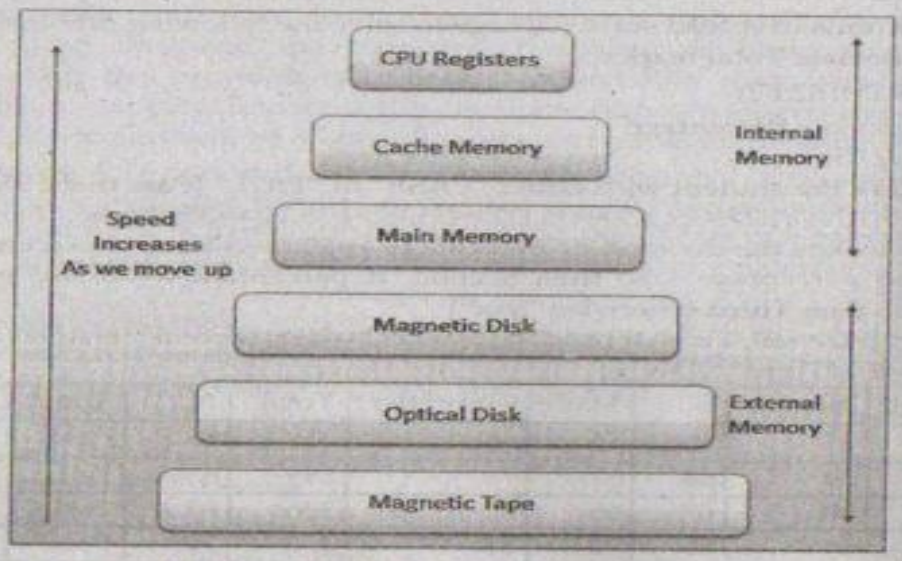
- Using the Underline Style drop-down list, you can choose from several types of underlining.
- The Effects area offers festive attributes — such as Shadow, Outline, Emboss, and Engrave — but you should save these for titles and headings.
- The best benefit of the Font dialog box is the Preview window, at the bottom. That window shows you exactly how your choices affect text in your document.

10. (i) What is Memory hierarchy? Explain the types of memory. [5]

Ans: In computer architecture, the memory hierarchy separates computer storage into a hierarchy based on response time. Since response time, complexity, and capacity are related, the levels may also be distinguished by their performance and controlling technologies. Memory hierarchy affects performance in computer architectural design, algorithm predictions, and lower level programming constructs involving locality of reference.

Memory is primarily of two types

- **Internal Memory** – cache memory and primary/main memory
- **External Memory** – magnetic disk / optical disk etc.



Characteristics of Memory Hierarchy are following when we go from top to bottom.

- Capacity in terms of storage increases
- Cost per bit of storage decreases
- Frequency of access of the memory by the CPU decreases
- Access time by the CPU increases

RAM

A RAM constitutes the internal memory of the CPU for storing data, program and program result. It is read/write memory. It is called random access memory (RAM). Since access time in RAM is independent of the address to the word that is, each storage location inside the memory is as easy to reach as other location & takes the same amount of time. We can reach into the memory at random & extremely fast but can also be quite expensive. RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup uninterruptible power system (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

RAM is of two types

- Static RAM (SRAM)
- Dynamic RAM (DRAM)

Static RAM (SRAM)

The word static indicates that the memory retains its contents as long as power remains applied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not have to be refreshed on a regular basis. Because of the extra space in the matrix, SRAM uses more chips than DRAM for the same amount of storage space, thus making the manufacturing costs higher. Static RAM is used as cache memory needs to be very fast and small.

Dynamic RAM (DRAM)

DRAM, unlike SRAM, must be continually refreshed in order for it to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory because it is cheap and small. All DRAMs are made up of memory cells. These cells are composed of one capacitor and one transistor.

ROM

ROM stands for Read Only Memory. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM, stores such instruction as are required to start computer when electricity is first turned on, this operation is referred to as bootstrap. ROM chip are not only used in the computer but also in other electronic items like washing machine and microwave oven.

Following are the various types of ROM:

MROM (Masked ROM)

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kinds of ROMs are known as masked ROMs. It is inexpensive ROM.

PROM (Programmable Read Only Memory)

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM programmer. Inside the PROM chip there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

EPROM (Erasable and Programmable Read Only Memory)

The EPROM can be erased by exposing it to ultra-violet light for duration of up to 40 minutes. Usually, an EPROM eraser achieves this function. During programming an electrical charge is trapped in an insulated gate region. The charge is retained for more than ten years because the charge has no leakage path. For erasing this charge, ultra-violet light is passed through a quartz crystal window (lid). This exposure to ultra-violet light dissipates the charge. During normal use the quartz lid is sealed with a sticker.

EEPROM (Electrically Erasable and Programmable Read Only Memory)

The EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of re-programming is flexible but slow.

Serial Access Memory

Sequential access means the system must search the storage device from the beginning of the memory address until it finds the required piece of data. Memory device which supports such access is called a Sequential Access Memory or Serial Access Memory. Magnetic tape is an example of serial access memory.

Direct Access Memory

Direct access memory or Random Access Memory, refers to conditions in which a system can go directly to the information that the user wants.

Memory device which supports such access is called a Direct Access Memory. Magnetic disks, optical disks are examples of direct access memory.

Cache Memory

Cache memory is a very high speed semiconductor memory which can speed up CPU. It acts as a buffer between the CPU and main memory. It is used to hold those parts of data and program which are most frequently used by CPU. The parts of data and programs are transferred from disk to cache memory by operating system, from where CPU can access them.

Auxiliary Memory

Auxiliary memory is much larger in size than main memory but is slower. It normally stores system programs, instruction and data files. It is also known as secondary memory. It can also be used as a virtual memory in case the main memory capacity has been exceeded. Secondary memories cannot be accessed directly by a processor. First the data/information of auxiliary memory is transferred to the main memory and then that information can be accessed by the CPU. Characteristics of Auxiliary Memory are following:

- **Non-volatile memory**: Data is not lost when power is cut off.
- **Reusable**: The data stays in the secondary storage on permanent basis until it is not overwritten or deleted by the user.
- **Reliable:** Data in secondary storage is safe because of high physical stability of secondary storage device.
- **Convenience**: With the help of computer software, authorized people can locate and access the data quickly.
- **Capacity**: Secondary storage can store large volumes of data in sets of multiple disks.
- **Cost**: It is much lesser expensive to store data on a tape or disk than primary memory.

ii. **What do you mean by presentation package? Write the basic elements of Power Point Window.** **[5]**

Ans: A presentation program is a software package used to display information in the form of a slide show. It has three major functions: an editor that allows text to be inserted and formatted, a method for inserting and manipulating graphic images, and a slide-show system to display the content.

Types of Presentation Software

Presentation software programs include, for example:

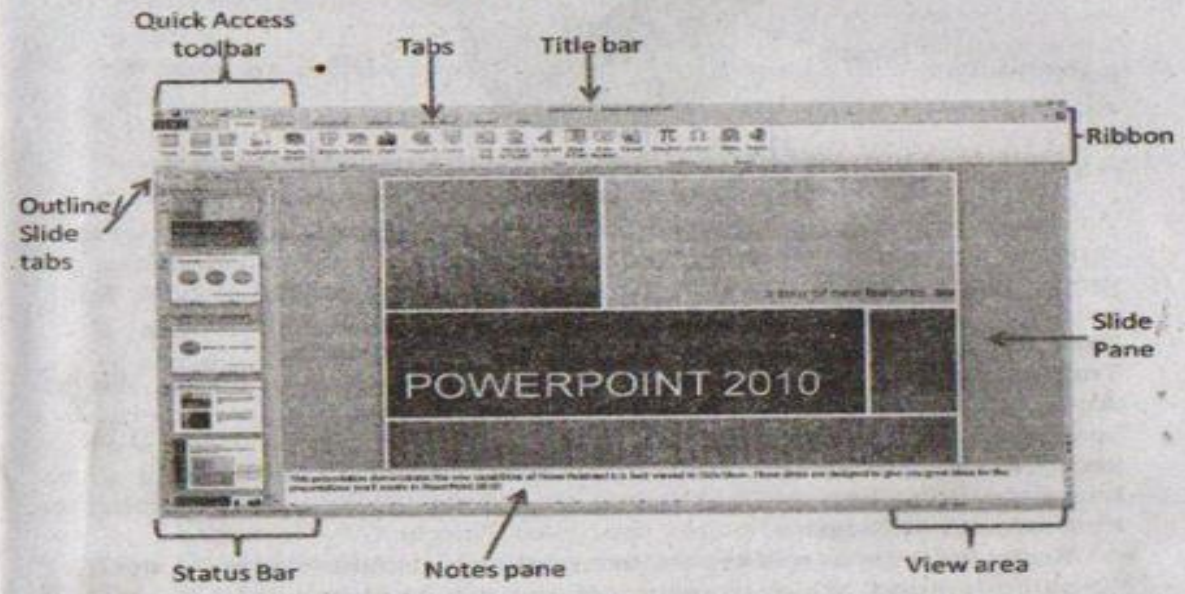
- **PowerPoint:** This leader on Windows platforms was created by Microsoft. PowerPoint can be bought separately or is included in the Microsoft Office suite of programs
- **OpenOffice.org Impress**: Created by Sun Microsystems Inc, Open Office Impress is part of a suite of programs offered as a free download. The suite also contains a word processor, a spreadsheet program, and a drawing program.
- **Windows Movie Maker:** This desktop video program was created by Microsoft and is installed on every Windows computer. Windows Movie Maker allows you to create and edit movies to use to accompany your presentation, although you can also add still photos or graphics and create a slideshow, just as in PowerPoint and Open Office Impress.

- **Keynote:** Created by Apple Computer, it's the leader in presentation software on a Mac platform. It was created for their OS X operating system. It is part of a suite of programs called iWork.

Basic elements of Power Point Window:

These elements include the Office button, Quick Access toolbar, Title bar, Tabs, scroll bars and a Status bar. Quick access toolbar contains buttons for commonly-used commands. Title bar indicates the software, the name of the presentation that is open, minimize, maximize, and close buttons.

The PowerPoint window contains many elements that are similar to other Microsoft Office programs. These elements include the Office button, Quick Access toolbar, Title bar, Tabs, scroll bars and a Status bar.



11. Define RGB color model. Explain the basic tools and transforms available in Adobe Photoshop. **[2 + 5+ 3]**

Ans: The RGB color model used in color CRT monitors. In this model, Red, Green and Blue are added together to get the resultant color white. Each color point within the bounds of the cube is represented as the triple (R, G, B).Where value for R, G, B are assigned in the range from 0 to 1. Here RGB color place together at 120 degree. RED + GREEN + BLUE = WHITE (contribute) all other colors are generated from these three primary colors. It is a type of Additive color model.

Magenta = red + blue

Cyan = green +blue

Yellow = red + green

The basic principle behind the working of the RGB color model is additive color mixing. It is the process of mixing 3 primary colors red, green and blue together in different proportions to make more different colors. For each primary color, it is possible to take 256 different shades of that color. So by adding 256 shades of 3 primary colors, we can produce over 16 million different colors. Cone cells or photoreceptors are part of a human eye that is

responsible for color perception. In the RGB color model, because of the combination of primary colors create different colors that we perceive by stimulating the different cone cells simultaneously.

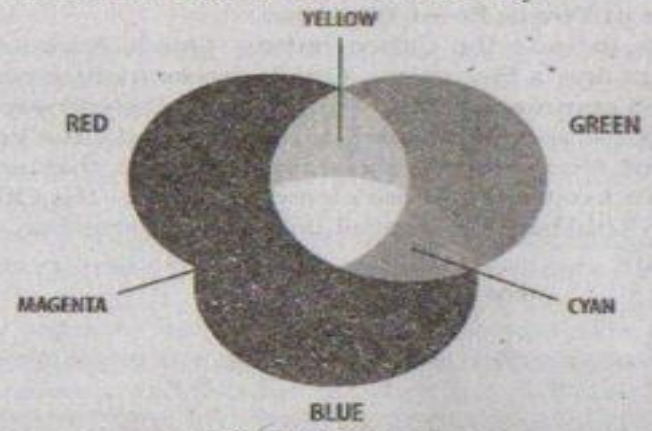


Fig: RGB color

As shown in the figure above, the addition of red, green and blue light will cause us to perceive different colors. For example, if we combine blue and green light in some proportions it will result in the formation of cyan. And if we combine red and green light it results in yellow light.

Basic tools and transforms available in Adobe Photoshop

Transforming scales, rotates, skews, stretches, or warps an image. We can apply transformations to a selection, an entire layer, multiple layers, or a layer mask. We can also apply transformations to a path, a vector shape, a vector mask, a selection border, or an alpha channel. Transforming affects image quality when we manipulate the pixels. To apply non-destructive transformations to raster images, use Smart Objects.

- **Scale:** Enlarges or reduces an item relative to its reference point, the fixed point around which transformations are performed. We can scale horizontally, vertically, or both horizontally and vertically.
- **Rotate:** Turns an item around a reference point. By default, this point is at the center of the object; however, we can move it to another location.
- **Skew:** Slants an item vertically and horizontally.
- **Distort:** Stretches an item in all directions.
- **Perspective:** Applies one point perspective to an item.
- **Warp:** Manipulates the shape of an item.
- **Rotate:** 180, Rotate 90 CW, Rotate 90 CCW. Rotates the item by the specified number of degrees, either clockwise or counterclockwise.
- **Flip:** Flips the item vertically or horizontally.

❑❑❑

TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

TU QUESTIONS-ANSWERS 2019

Course Title: Introduction to Information Technology — Full Marks: 60
Course No: CACS101 — Pass Marks: 24
Nature of the Course: Theory + Lab — Time: 3
Semester: I

Candidates are required to answer the questions in their own words as far as possible.

Group A

Attempt all the questions. **[10x1 = 10]**

1. Circle (O) the correct answer.

i. Which one of the following is not a non-impact printer?
a) Inkjet b) Dot-matrix c) Laser d) Thermal

ii. Which one of the following is the example of the utility software?
a) Anti-virus b) Operating system
c) Language translators d) Word Processor

iii. Which one of the following is not a Network Operating System?
a) Unix b) Linux
c) Windows 7 d) Windows Server

iv. Which one of the following key is used to uniquely identify a row in table?
a) Composite key b) Foreign Key
c) Candidate Key d) Primary Key

v. Which one of the following layer of OSI reference model contains TCP protocol?
a) Network Layer b) Transport Layer
c) Data Link Layer d) Application Layer

vi. Which one of the following is not a web server?
a) Apache b) IIS c) GWS d) HTTP

vii. Which one of the following is a crypto-currency?
a) Credit Card b) PayPal c) Bit Coin d) Mater Card

viii. Which one of the following command is used to shut down the computer normally?
a) shutdown /f b) shutdown /s c) shutdown /h d) shutdown /r

ix. What is the default font type in MS Word 2016?
a) Arial b) Times New Roman
c) Calibri d) Microsoft Sans Serif

x. Which one of the following key is used for help in MS – PowerPoint?
a) F1 b) F5 c) F6 d) F11

Answers Key

i. (c)	ii. (a)	iii. (c)	iv. (d)	v. (b)	vi. (c)	vii. (c)	viii. (b)	ix. (c)	x. (a)

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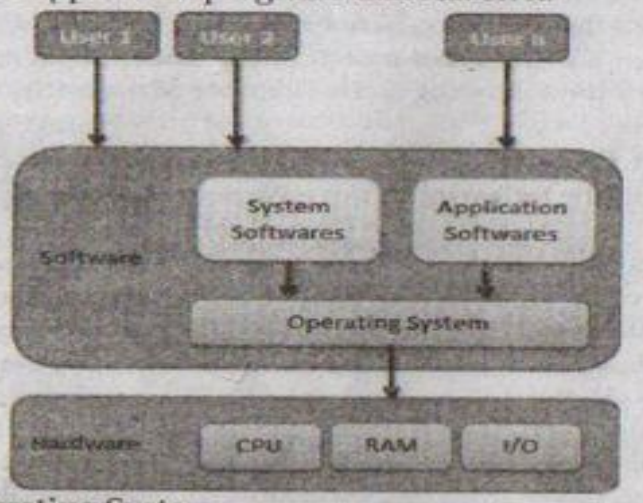
Group B

Attempt any SIX questions. **[6x5 = 30]**

2. What is Operating system? Explain the major functions of Operating System. **[1+4]**

Ans: An operating system (OS) is system software that manages computer hardware and software resources and provides common services for computer programs. The Operating System is a program with the following features:

- The main part of the computer system is an operating system. It is a program that acts as an interface between the software and the computer hardware. It is the master control program that runs the computer.
- It is an integrated set with the specialized programs which are used to manage all the resources and operations of the computer.
- It is treated as special type of software that controls and monitors the programs execution that is stored in the form of data in the computer, including application programs and other system software. It is an important component of the computer system, because it sets the standards for application programs that run on it.



Features of Operating System

Here is a list of some of the most prominent characteristic features of Operating Systems:

- **Memory Management:** observes the use of the primary memory, i.e. what part of it is in use by whom, what part is not in use, etc. and allocates the memory when a process or program requests it.
- **Processor Management:** Allocates the processor (CPU) to a process and de-allocates the processor when it is not required anymore.
- **Device Management:** Keeps track of all the devices. This is also called I/O controller that decides which process gets the device, when, and for how much time.
- **File Management:** Allocates and de-allocates the resources and decides who gets the resources.
- **Security:** Prevents unauthorized access to programs and data from other persons by means of passwords and other similar techniques.

- **Job Accounting:** Keeps the track record of time and resources used by various jobs and/or users.
- **Control over System Performance:** It helps to record delays between the request for a service and from the system.
- **Interaction with the Operators:** Interaction takes place in instructions form from the computer. The Operating System acknowledges the same, performs the corresponding action, and informs the operation with the help of display screen.
- **Error-detecting Aids:** Production of dumps, traces, error messages, and other debugging and error-detecting methods are used.
- **Coordination between other software and users:** Coordination and assignment of compilers, interpreters, assemblers, and other software to the various users of the computer systems. Operating system controls all the functions that are being performed on the hard disk and coordinates with other software applications.

3. **Differentiate between primary and secondary memory.** [5]

Ans: Memory is very much like our brain as it is used to store data and instructions. Computer memory is the storage space where data is to be processed, and instructions needed for processing are stored. The memory is divided into a large number of smaller portions called the cell. Every cell/ location has a unique address and a size. Two types of memories are:

- Primary Memory
- Secondary Memory

Differences between primary memory and secondary memory are tabulated below:

Primary memory	Secondary memory
Primary memory is the main memory of the computer system. Accessing data from primary memory is faster because it is an internal memory of the computer.	All secondary storage devices which are capable of storing high volume data is referred to secondary memory. It's slower than primary memory. However, it can save a substantial amount of data, in the range of gigabytes to terabytes.
The primary memory is categorized as volatile & nonvolatile memories.	The secondary memory is always a non-volatile memory.
These memories are also called internal memory.	Secondary memory is known as a Backup memory or Additional memory or Auxiliary memory.
Data is directly accessed by the processing unit.	Data cannot be accessed directly by the processor. It is first copied from secondary memory to primary memory. Only then CPU can access it.
It's a volatile memory meaning data cannot be retained in case of power failure.	It's a non-volatile memory so that that data can be retained even after power failure.
It holds data or information that is currently being used by the processing unit. Capacity is usually in 16 to 32 GB	It stores a substantial amount of data and information. Capacity is generally from 200GB to terabytes.
Primary memory can be accessed by the data bus.	Secondary memory is accessed by I/O channels.
Primary memory is costlier than secondary memory.	Secondary memory is cheaper than primary memory.

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4. What is computer virus? Explain symptoms of computer virus. [1+4]

Ans: A computer virus is a type of computer program that, when executed, replicates itself by modifying other computer programs and inserting its own code. When this replication succeeds, the affected areas are then said to be "infected" with a computer virus.

There are a lot of symptoms of computer virus but some of major symptoms are listed below:

- Unexpected pop-up windows
- Slow start up and slow performance
- Suspicious hard drive activity
- Lack of storage space
- Missing files
- Crashes and error messages
- High network activity
- Email is hijacked
- Browser woes
- Security attacks etc.

5. Define database? Explain the advantages of database over file based system. [1+4]

Ans: A database is an organized collection of data, generally stored and accessed electronically from a computer system. Let's discuss few examples.

An online telephone directory would definitely use database to store data pertaining to people, phone numbers, other contact details, etc.

Advantages of database over file based system are listed below:

There are several advantages of Database management system over file system. Few of them are as follows:

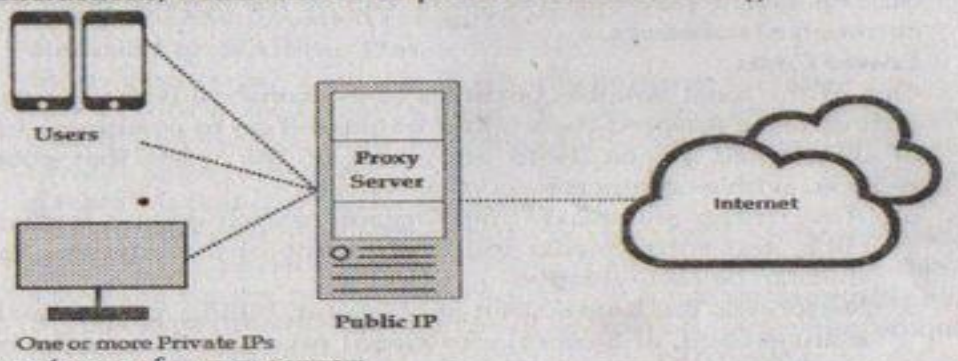
- **No redundant data:** Redundancy removed by data normalization. No data duplication saves storage and improves access time.
- **Data Consistency and Integrity:** As we discussed earlier the root cause of data inconsistency is data redundancy, since data normalization takes care of the data redundancy, data inconsistency also been taken care of as part of it
- **Data Security:** It is easier to apply access constraints in database systems so that only authorized user is able to access the data. Each user has a different set of access thus data is secured from the issues such as identity theft, data leaks and misuse of data.
- **Privacy:** Limited access means privacy of data.
- **Easy access to data** – Database systems manages data in such a way so that the data is easily accessible with fast response times.
- **Easy recovery:** Since database systems keep the backup of data, it is easier to do a full recovery of data in case of a failure.
- **Flexible:** Database systems are more flexible than file processing systems.

6. What is proxy server? Write down the benefit of using proxy server in the organization. [5]

Ans: A proxy server acts as a gateway between you and the internet. It's an intermediary server separating end users from the websites they browse. Proxy servers provide varying levels of functionality, security, and privacy depending on your use case, needs, or company policy. If you're using a

proxy server, internet traffic flows through the proxy server on its way to the address you requested. The request then comes back through that same proxy server and then the proxy server forwards the data received from the website to you.

An advantage of a proxy server is that its cache can serve all users. If one or more Internet sites are frequently requested, these are likely to be in the proxy's cache, which will improve user response time. A proxy can also log its interactions, which can be helpful for troubleshooting.



Advantages of proxy server:

There are lots of advantages in using a proxy server. Let's give an eye on it.

- Proxy server helps the clients to protect their important information from getting hacked by hackers.
- A proxy server is also used in bypassing blocked websites. It happens many a time that in some offices or schools or in any organizations they blocked some of the websites for their own reasons. Also, many websites have some country restrictions. In those cases, if you want to access those websites, the proxy server will help you in doing that.
- The proxy server is also used to enhance the security and privacy level of the client's device while doing surfing using different proxies.
- Proxy server many times used for speeding up the browsing and access data, because of their good cache system.
- As the cache system of the proxy server is very good, when you access any websites using a proxy server, it is having the chance to store your desired data in their cache system. And as a result, you can access them whenever you want.

7. Define e-commerce? Mention the benefits of using it in the context of customer? [1+4]

Ans: E-commerce is the activity of electronically buying or selling of products on online services or over the Internet. Ecommerce, also known as electronic commerce or internet commerce, refers to the buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions. Ecommerce is often used to refer to the sale of physical products online, but it can also describe any kind of commercial transaction that is facilitated through the internet.

The benefits of using e-commerce in the context of customer are listed below:

- **Overcome Geographical Limitations**

  If you have a physical store, you are limited by the geographical area that you can service. With an e-commerce website, the whole world is your playground. Additionally, the advent of m-commerce, i.e., e-

commerce on mobile devices, has dissolved every remaining limitation of geography.

- **Gain New Customers with Search Engine Visibility**
  Physical retail is driven by branding and relationships. In addition to these two drivers, online retail is also driven by traffic from search engines. It is not unusual for customers to follow a link in search engine results and land on an e-commerce website that they have never heard of. This additional source of traffic can be the tipping point for some e-commerce businesses.
- **Lower Costs**
  One of the most tangible positives of e-commerce is the lowered cost. A part of these lowered costs could be passed on to customers in the form of discounted prices. Here are some of the ways that costs can be reduced with e-commerce:
  - Advertising and marketing: Organic search engine traffic, pay-per-click, and social media traffic are some of the advertising channels that can be cost-effective.
  - Personnel: The automation of checkout, billing, payments, inventory management, and other operational processes lowers the number of employees required to run an e-commerce setup.
- **Locate the Product Quicker**
  It is no longer about pushing a shopping cart to the correct aisle or scouting for the desired product. On an e-commerce website, customers can click through intuitive navigation or use a search box to narrow down their product search immediately. Some websites remember customer preferences and shopping lists to facilitate repeat purchase.
- **Eliminate Travel Time and Cost**
  It is not unusual for customers to travel long distances to reach their preferred physical store. E-commerce allows them to visit the same store virtually, with just a few mouse clicks.
- **Provide Comparison Shopping**
  E-commerce facilitates comparison shopping. There are several online services that allow customers to browse multiple e-commerce merchants and find the best prices.
- **Enable Deals, Bargains, Coupons, and Group Buying**
  Though there are physical equivalents to deals, bargains, coupons, and group buying, online shopping makes it much more convenient. For instance, if a customer has a deep discount coupon for turkey at one physical store and toilet paper at another, she may find it infeasible to avail of both discounts. But the customer could do that online with a few mouse-clicks.
- **Provide Abundant Information**
  There are limitations to the amount of information that can be displayed in a physical store. It is difficult to equip employees to respond to customers who require information across product lines. E-commerce websites can make additional information easily available to customers. Most of this information is provided by vendors and does not cost anything to create or maintain.

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- **Create Targeted Communication**
  Using the information that a customer provides in the registration form, and by placing cookies on the customer's computer, an e-commerce merchant can access a lot of information about its customers. It, in turn, can be used to communicate relevant messages. An example: If you are searching for a certain product on Amazon.com, you will automatically be shown listings of other similar products. Also, Amazon.com may email you about related products.
- **Remain Open All the Time**
  Store timings are now 24/7/365. E-commerce websites can run all the time. From the merchant's point of view, this increases the number of orders they receive. From the customer's point of view, an "always open" store is more convenient.
- **Create Markets for Niche Products**
  Buyers and sellers of niche products can find it difficult to locate each other in the physical world. Online, it is only a matter of the customer searching for the product in a search engine. One example could be the purchase of obsolete parts. Instead of trashing older equipment for lack of spares, today we can locate parts online with great ease.

8. Consider the following structure and answer the questions. (E:/> is current prompt)

a) Write down DOS command to create above files and directories. [2]

Ans: E:\> mkdir "Dir_Name" Or E:\> md "Dir_Name"
E:/> copy con file_name.txt

b) *Write down DOS command to move all text file into dir_3 directory.* [1]

Ans: E:/> move file_name.txt E:\Dir_Name

c) *Write DOS command to delete dir_1 directory.* [1]

Ans: rmdir E:\>Dir_Name

d) *Hide the root directory from E drive.* [1]

Ans: E:/> attrib +s +h \.

Group C

Attempt any TWO questions. **[2x10 = 20]**

9. (a) From the following spreadsheet, write the formula to address the following conditions:

ABC Company
Kathmandu

	A	B	C	D	E	F	G	H	I
1	SN	Name	Addr	Post	Salary	Bonus	Tax	HA	Total
2	1	Ram	Ktm	Manager	12000				
3	2	Sham	Pokhara	Accountant	11500				
4	3	Hari	Pokhara	Engineer	10000				
	Maximum Salary				?				

Conditions:

1. Bonus will give 15% of salary If his/ her salary is less than and equal to 6000. [1]

Ans: =IF(E2>6000,0.15*E2, 0)

2. Tax will pay 10% of salary if his/ her post is manager [1]

Ans: =IF(D2="Manager",0.01*E2, 0)

3. HA will get 5% of salary, if he/she is not from Ktm. [1]

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Ans: =IF(C2<>"Ktm",0.05*E2, 0)

4. Total is equal to the sum of (Salary, Bonus and Ha) by deducting the Tax [1]

Ans: =E2+F2+H2-G2

5. Write a formula to find the maximum salary above the excel sheet. [1]

Ans: =MAX(E2:E4)

b) What is Photoshop? Explain five major tools of Photoshop. [1+4]

Ans: Photoshop is Adobe's photo editing, image creation and graphic design software. The software provides many image editing features for raster (pixel-based) images as well as vector graphics. It uses a layer-based editing system that enables image creation and altering with multiple overlays that support transparency. Layers can also act as masks or filters, altering underlying colors. Shadows and other effects can be added to the layers. Photoshop actions include automation features to reduce the need for repetitive tasks. An option known as Photoshop CC (Creative Cloud) allows users to work on content from any computer.

Photoshop been the industry standard image manipulation program for so long that its name has become a verb: It is common parlance to say that an image has been "photo shopped" or even just "shopped." Shopped, in this context, is synonymous with edited, manipulated or faked often regardless of the software actually used. Photoshop is used by photographers, graphic designers, video game artists, advertising and meme designers.

1. **Move Tool (Keyboard: V)**
   The move tool simply lets you move objects in a given layer around the Photoshop canvas. To use it, click anywhere on the canvas and drag. As you drag, the Photoshop layer will move with your mouse.
2. **Marquee (Keyboard: M)**
   The marquee lets you select part of the canvas in a specific shape. By default you get a rectangular (or perfect square if you hold down shift while selecting), but you can also select in the shape of an ellipse (or a perfect circle if you hold down shift while selecting).
3. **Lasso (Keyboard: L)**
   The lasso is a free-form selection tool that lets you drag around the canvas and select anything the lasso'd area covers. Within this tool you also have access to the polygonal lasso, which lets you create a selection by clicking around on the canvas and creating points, and the magnetic lasso, which works the same as the regular lasso but attempts to detect edges for you and automatically snap to them.
4. **Magic Wand (Keyboard: W)**
   Clicking an area with the magic wand will tell Photoshop to select the spot you clicked on and anything around it that's similar. This tool can be used as a crude way to remove backgrounds from photos.
5. **Crop Tool (Keyboard: C)**
   The crop tool is used to (surprise!) crop your pictures. You can specify the exact size and constrain the crop tool to those proportions, or you can just crop to any size you please.

10. a) What is word processor? Explain the major functions available in the Home tab of word document. [5]

Ans: A word processor is a device or computer program that provides for input, editing, formatting and output of text, often with some additional features.

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Early word processors were stand-alone devices dedicated to the function, but current word processors are word processor programs running on general purpose computers.

The Home Tab is by far the most important Tab in Microsoft Word. The Home Tab contains all the commands that are used most often. These include formatting commands like changing text size, font style, font color, list types, and clipboard functionality like Cut, Copy and Paste. Furthermore, the home tab in Word includes features like text alignment, line spacing, gallery styles and theme settings. Finally, the Home Tab includes the asrcility to find and replace text.

The groups on the Home Tab are as follows:

- Clipboard
- Font
- Paragraph
- Styles
- Editing

Clipboard Group

Paste: This button is used to insert items that have been stored on the clipboard into a document.

Cut: To remove text or other items from a document and store it on the clipboard, click this button.

Copy Click: This button to make a copy of selected text or another item in a document and store it on the clipboard

Format Painter: To make a copy of selected text and then apply the formatting to other text in a document, click this button. A single click will apply the formatting to other selected text one time. To apply the formatting to other selected text several times, click the format painter button twice. When all the formatting has been applied, click the button again to deactivate the format painter.

Clipboard Launcher: This button is located in the lower right corner of the Clipboard group. It is used to open the Clipboard Task Pane. This task pane will display when items that are added to the clipboard are displayed. This allows more than one item to be added to the clipboard before the items are pasted into the document.

Font Group, Font Type: To select the type of font for a whole document or for selected text within the document, click this button.

Font Size: This button is used to change the size of the font for the whole document or for selected text within the document.

Change Case: To change the selected text to UPPERCASE, lowercase, or to apply other capitalization, click this button.

Clear All Formatting: To clear all the formatting that has been applied to selected text, click this button.

Groups/Buttons Description

Bold: Click this button to apply bold formatting to selected text in a document

Italics: This button is used to italicize selected text in a document.

Underline: To underline selected text in a document, click this button.

Strikethrough: This button is used to draw a line through selected text in a document.

Subscript: To create small letters below the text baseline, click this button.

Superscript: Click this button to create small letters above the line of text.

Text Effects and Typography: This button is used to apply visual effects, such as shadow, glow, or reflection to selected text in a document.

b) Define Network Topology? Write down the advantages of Network. [1+4]

Ans: Network topology is the arrangement of the elements of a communication network. Network topology can be used to define or describe the arrangement of various types of telecommunication networks, including command and control radio networks, industrial field busses and computer networks.

Advantages of computer networking

Main benefits of networks include:

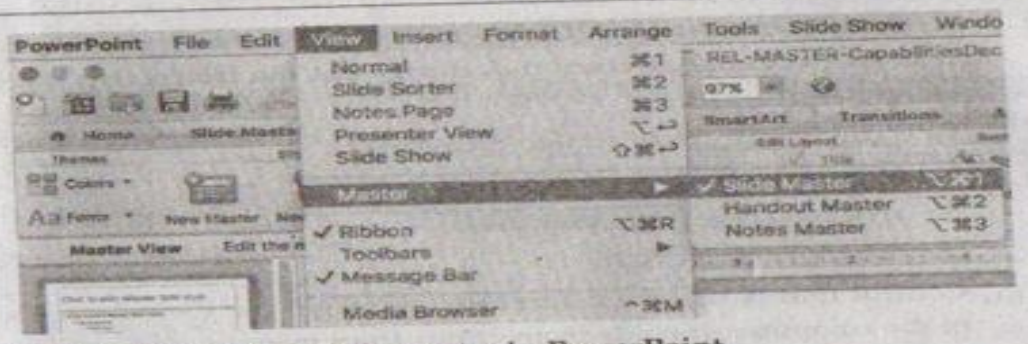
- **File sharing** – you can easily share data between different users, or access it remotely if you keep it on other connected devices.
- **Resource sharing** – using network-connected peripheral devices like printers, scanners and copiers, or sharing software between multiple users, saves money.
- **Sharing a single internet connection** – it is cost-efficient and can help protect your systems if you properly secure the network.
- **Increasing storage capacity** – you can access files and multimedia, such as images and music, which you store remotely on other machines or network-attached storage devices.

11. a) What is animation? What are the advantages of using slide master in PowerPoint? [1+4]

Ans: Animation is the capturing of sequential, static images—drawings or photos of inanimate objects—and playing them in rapid succession to mimic real world motion. Animation is a method in which pictures are manipulated to appear as moving images. In traditional animation, images are drawn or painted by hand on transparent celluloid sheets to be photographed and exhibited on film. Today, most animations are made with computer-generated imagery.

Slide master

The slide master is the top slide in a hierarchy of slides that stores information about layout including the background, color, fonts, effects, placeholder sizes, and positioning. The key benefit to using slide master is that you can make changes to every slide in your presentation, quickly. It also enables every slide on your presentation to follow a singular theme and look cohesive – perfect for creating a professional business presentation. Slide Master can be accessed by navigating to View > Master > Slide Master.



Advantages of using slide master in PowerPoint

The key benefit to modifying and using slide masters is that you can make universal style changes to every slide in your presentation, including ones added later to the presentation. . When you use a slide master, you save time because you don't have to type the same information on more than one slide. The slide master especially comes in handy when you have extremely long presentations with lots of slides.

Because slide masters affect the look of your entire presentation, when you create and edit a slide master or corresponding layouts, you work in Slide Master View. The slide master helps in -1) changing font colors and styles for every slide2) add a clipart or picture to every slide3) add a footer or date to every slide.

b) Explain block diagram of computer and its various components. [5]

Ans: Computer is an electronic device which performs tasks given by user with extremely fast speed and accuracy. Like any other device or machine, a computer system has also a number of parts. A computer system can be blocked into mainly three parts:

- Input Unit
- Central Processing Unit
- Output Unit

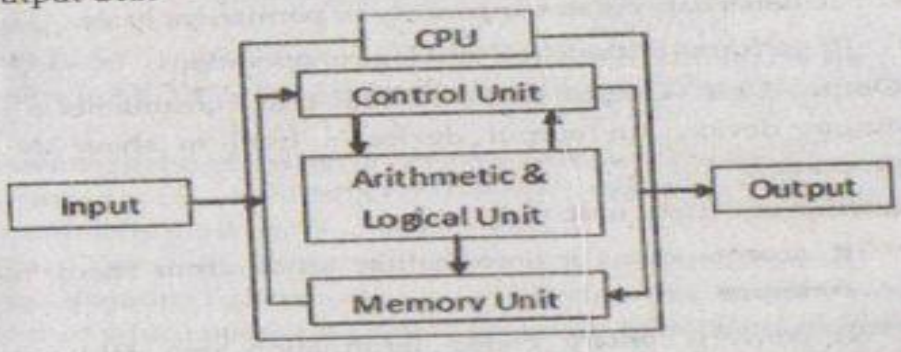


Fig: Block Diagram of Computer

1. **Input unit** – Input unit is a unit that accepts any input device. The input device is used to input data into the computer system.

   Function of input unit:

   - It converts inputted data into binary codes.
   - It sends data to main memory of computer.

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2. **Central Processing Unit (CUP)** – CPU is called the brain of a computer. It is an electronic circuitry that carries out the instruction given by a computer program.

   CPU can be sub classified into three parts.

   i. Control unit (CU)
   ii. Arithmetic & Logic unit (ALU)
   iii. Memory Unit (MU)

i. **Control unit (CU)** - the control unit manages the various components of the computer. It reads instructions from memory and interpretation and changes in a series of signals to activate other parts of the computer. It controls and co-ordinate is input output memory and all other units.

ii. **Arithmetic & Logic unit (ALU)** – The arithmetic logic unit (ALU), which performs simple arithmetic operation such as +,-, *, / and logical operation such as >, <, =<, <= etc.

iii. **Memory Unit (MU)**- Memory is used to store data and instructions before and after processing. Memory is also called Primary memory or internal memory. It is used to store data temporary or permanently.

Function of CPU:

- It controls all the parts and software and data flow of computer.
- It performs all operations.
- It accepts data from input device.
- It sends information to output device.
- Executing programs stored in memory
- It stores data either temporarily or permanent basis.
- It performs arithmetical and logical operations.

3. **Output Unit** –Output unit is a unit that constituents a number of output device. An output device is used to show the result of processing.

   Function of Output unit:

   - it accepts data or information sends from main memory of computer
   - It converts binary coded information into HLL or inputted languages.

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MODEL QUESTIONS SETS FOR PRACTICE

MODEL SET 1

Course Title: Computer Fundamental and Applications — Full Marks: 60
Course No: CACS101 — Pass Marks: 24
Nature of the Course: Theory + Lab — Time: 3
Semester: I

Group– A

Attempt all the questions **[10 x1=10]**

1. Circle (O) the correct answer in the following questions:

i. WINDOWS is:
a. antivirus software b. data storage device
c. programming language d. operating system

ii. The primary job of the operating systems of a computer is to:
a. Manage resources b. provide utilities
c. Provide communication interface d. None of these

iii. A hard disk is divided into tracks which are further subdivided into:
a. Clusters b. Sectors
c. Vectors d. None

iv. What is Android?
a. A toy b. Laptop Software
c. Mobile Operating System d. Star

v. Which one of the following is not application software?
a. Java b. MS Word
c. MS Excel d. Accounting Package

vi. Usually, in MS DOS, the primary hard disk drivers has the driver letter
a. A b. B c. C d. Any letter

vii. Which one of the following is not a open source operating system?
a. Linux b. UNIX c. Windows d. Sun Solaris

vii. All computers must have:
a. Word Processing Software b. A printed attached
c. An Operating System d. A virus checking program

ix. Printer in which output is printed by use of light beam and particles of ink infused on paper is best classified as
a. character printer b. line printers
c. laser printer d. beam printer

x. Type of plotter in which paper is held stationary and paper is held by underneath section is classified as
a. drum plotter b. flat bed plotter
c. desk jet plotter d. ink jet plotter

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Group– B

Attempt any SIX questions [6 x5 =30]

2. What is Computer? Describe characteristics of Computer with suitable example.
3. What is database administrator? Describe responsibilities of database administrator.
4. What is open source operating system? Describe their advantages and disadvantages.
5. How program differ from software? Describe types of software with suitable example.
6. What is the purpose of OSI Reference Model? Explain OSI Reference Model with their functions.
7. What is input device? Describe various input devices used in computer system in brief.
8. Write the DOS commands to complete following tasks:
   a. Write a DOS command to undelete a bunch of files with extension DOC that you have just deleted?
   b. delete the directory that is empty
   c. Rename the file name *bcainfo.txt* with *csitinfo.txt*.
   d. Command used to switch directories.
   e. Command which allows the user to clear the complete contents of the screen and leave only a prompt.

Group – C

Attempt any TWO questions. [2x10 =20]

9. i) You are provided following data:

Bhanu Higher secondary School Kanchanpur

	A	B	C	D	E	F	G	H	I	J
7	Comp	Maths	Eng	Pop	Health	Total	Average	Percentage	Result	Divi
8	22	25	78	32	77					
9	43	65	77	87	87					
10	55	65	90	88	90					
11	65	44	89	79	99					
12	89	33	76	55	33					

Write the formula in spread sheet package to solve the following problems:

a. Calculate Total marks
b. Calculate average marks of each student
c. Calculate Percentage
d. Mark the student with either "PASS" or "FAIL" [Pass mark 33 full marks 100]
e. Calculate the division [if result =PASS and if percentage >=60 then First, if percentage >=45 and percentage < 60 then Second, if percentage >=35 and percentage <45 then Third otherwise "xxx"]

ii) Explain the printing document process in Office package. [5]

10. (i) What is secondary memory? Explain the types of secondary memory. [5]
    (ii) What do you mean by spreadsheet package? Describe features of spread sheet package. [5]
11. Define virtual reality. How it is differ from computer graphics? Explain Bit Coin with their legal issues at the contest of Nepal. [2 + 5+ 3]

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MODEL SET 2

Group– A

Attempt all the questions [10x1=10]

1. **Circle (O) the correct answer in the following questions**

i. RAM' stands for
   a. Random Access Memory
   b. Read Access Memory
   c. Read Arithmetic Memory
   d. Random Arithmetic Memory

ii. Teletypewriter terminal is an example of
   a. input devices
   b. output devices
   c. input/output devices
   d. storage devices

iii. Silicon piece with a system circuit on it is termed as
   a. chip
   b. circuit
   c. logical gate
   d. circuit network

iv. Actual equipment of computer system that can be touched is:
   a. hardware
   b. software
   c. applications
   d. bugs

v. What is true about super computers?
   a. they can fit on a single small chip
   b. they are found at thousands of places around the world
   c. they cost only few thousand rupee
   d. they can process billions of operations in a second

vi. The linking of computers with a communication system is called
   a. networking
   b. pairing
   c. interfacing
   d. assembling

vii. Which of the following is not used as secondary storage?
   a. Semiconductor memory
   b. magnetic disks
   c. Magnetic drums
   d. magnetic tapes

viii. Integrated circuits are classified according to the
   a. no. of chips
   b. no. of vacuum tube
   c. no. of gates
   d. no. of transistor

ix. In terms of processing power there is a class of computers between minicomputers and microcomputers known as
   a. Supercomputer
   b. Mainframe
   c. Personal computer
   d. Workstation

x. Printer type in which cylindrical platen and needles are pushed electrically is classified as
   a. of-band printer
   b. dot matrix printer
   c. ink matrix printer
   d. font printer

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Group– B

Attempt any SIX questions [6×5 =30]

2. What are the application areas of computer? Explain.
3. What is database? How it is differ from DBMS? Describe data mining with their features.
4. What is the meaning of mobile computing? Describe features of mobile computing.
5. What is compiler? How it is differ from interpreter? Describe types of translators used in programming languages.
6. What is virus? Explain types of viruses with their functions.
7. What is output device? Describe various output devices used in computer system in brief.
8. Write the DOS commands to complete following tasks:
   a. Display current directory (show all files and sub-directories).
   b. Displays any files in the current directory with .TXT as their extension
   c. Copy the file "letter.txt" to a file called "letter.bak".
   d. Copy any file with an extension PIC from the A: floppy drive, in the PICTURES directory to the root directory of the hard disk.
   e. Make a new directory "BCA" within D drive.

Group – C

Attempt any TWO questions. [2x10 =20]

9. i) You are provided following data:

Bhanu Higher secondary School Kanchanpur

	A	B	C	D	E	F	G	H	I	J
7	Comp	Maths	Eng	Pop	Health	Max	Min	Average	Count	Diff
8	22	25	78	32	77					
9	43	65	77	87	87					
10	55	65	90	88	90					
11	65	44	89	79	99					
12	89	33	76	55	33					

Write the formula in spread sheet package to solve the following problems:

a. Calculate maximum marks of the subject
b. Calculate minimum marks of the subject
c. Calculate average marks
d. Calculate difference of maximum marks and minimum marks.
e. Count number of failed subjects

ii) what is pivot table in spread sheet package? How to construct and analyze pivot table? Explain. [5]

10. (i) What is virtual memory? Differentiate between RAM and ROM. [5]
    (ii) What is the use of Photoshop? Describe features and key functions of Photoshop package.
11. Define hypermedia? Explain the concept of Artificial Intelligence and Ambient Intelligence with suitable example. [2 + 5+ 3]

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MODEL SET 3

Group– A

Attempt all the questions **[10 x1=10]**

1. **Circle (O) the correct answer in the following questions**

i. "COMPUTER" term is derived from .....?
   a. Latin b. French c. Arabic d. German

ii. What is the proper way of shut down a computer?
   a. Click on START button and press shutdown
   b. Switch of power supply directly
   c. Remove the power cable d. Any of the above

iii. A hard disk is divided into tracks, which are further subdivided into
   a. clusters b. sectors c. vectors d. heads

iv. The CPU control unit is responsible for
   a. obtaining instructions b. interpreting instructions
   c. all logic functions d. both A and B

v. Which of the following is NOT a type of operating system software?
   a. Windows b. Linux
   c. Macintosh d. Communications and Organization

vi. .....is a combination of hardware and software that facilitates the sharing of information between computing devices
   a. network b. peripheral
   c. expansion board d. digital device

vii. The following is an example of a computer peripheral:
   a. The CPU b. The Motherboard.
   c. The Keyboard d. RAM.

viii. WAN stands for
   a. Wap Area Network b. Wide Area Network
   c. Wide Array Net d. Wireless Area Network

ix. Junk e-mail is also called
   a. spam b. spoof c. sniffer script d. spool

x. Which Printer is a Non-impact Printer?
   a. Dot Matrix b. Thermal Printer
   c. Daisy Wheel d. Ink jet Printer

Group– B

Attempt any SIX questions **[6 x5 =30]**

2. Explain about the different generation of Programming Languages.
3. What is data warehouse? How it is differ from database? Describe data mining with their features.

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4. What do you mean by computer memory? Describe memory and its classification.
5. Why modulation is necessary in communication system? Explain briefly different types of modulation.
6. What is antivirus software? Why does business need antivirus protection?
7. What RAM? Describe types of RAM with their advantages and disadvantages.
8. Write the DOS commands to complete following tasks:
   a. Sort the directory listing, such as oldest files at the top
   b. Displays any files in the current directory with .txt as their extension
   c. Copy the file "abc.txt" to a file called "bbc.bak".
   d. delete or erase one or more files or directories (folders)
   e. view configuration of all network adapters

Group – C

Attempt any TWO questions. [2 x10 =20]

9. i) use the following Company sales information to write formula for following questions.

	A	B	C	D	E	F	G	H	I
	XYZ COMPANY SALES PERFORMANCE								
5	SALES PERSON	ANNUAL TARGET	QTR1	QTR2	QTR3	QTR4	TOTAL SALES	AVERAGE SALES	COMMISSION
6	ALBERT	750	148	256	133	154			
7	MICHAEL	650	187	143	258	143			
8	CARL	800	233	200	216	152			
9	GEORGE	700	256	145	136	259			
10	LUCY	1,000	249	212	215	124			
11									
12	TOTAL								
13									
14	COMMISSION	6%							
15									

Write the formula in spread sheet package to solve the following problems:
   a. Write formulas or describe how you would calculate the Total Sales in column G and Row 12.
   b. Calculate average sales
   c. Calculate commission
   d. Display name of the quarter with maximum sales
   e. Sort total sales in ascending order.

   (ii) . What is the Adobe Photoshop? How you can resize the image in Adobe Photoshop?

10. (i) What is internet? Write down advantages and disadvantages of internet, intranet and extranet. [5]
    (ii) What is the use of power point application software? How you can copy slide master from one presentation to another in PowerPoint. [5]
11. (i) What is the use of SQL in database? Explain Relational data model with suitable example. [1+4]
    (ii) Write short note about following: [2.5+2.5]
    - E-Commerce
    - E-learning

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MODEL SET 4

Group– A

Attempt all the questions **[10 x1=10]**

1. Circle (O) the correct answer in the following questions

i. WINDOWS is:
   a. antivirus software b. data storage device
   c. programming language d. operating system

ii. The primary job of the operating systems of a computer is to:
   a. Manage resources b. provide utilities
   c. Provide communication interface d. None of these

iii. A hard disk is divided into tracks which are further subdivided into:
   a. Clusters b. Sectors c. Vectors d. None

iv. What is Android?
   a. A toy b. Laptop Software
   c. Mobile Operating System d. Star

v. Which one of the following is not application software?
   a. Java b. MS Word
   c. MS Excel d. Accounting Package

vi. Which one of the following is not a open source operating system?
   a. Linux b. UNIX b. Windows d. Sun Solaris

vii. Which one of the following operating system is not a multitasking operating system?
   a. DOS b. LINUX c. Windows 98 d. UNIX

viii. The difference between impact and nonimpact printers
   a. Impact printers are faster than non- impact printers
   b. Impact printers make direct physical contact with paper, non impact don't
   c. Impact printers produce better quality prints
   d. All of the above

ix. Which device is required for the Internet connection?
   a. Joystick b. Modem c. CD Drive d. NIC Card

x. What is a light pen?
   a. A Mechanical Input device b. Optical input device
   c. Electronic input device d. Optical output device

Group– B

Attempt any SIX questions **[6 x5 =30]**

2. What are the advantages and disadvantages of computer?
3. What is data? How it is differ from information? Describe database security strategy.
4. What is the use of ROM? Describe different types of ROM memory.
5. What is topology? Explain types of computer networks with suitable examples.
6. What is video-conferencing? How can you achieve video conference? Explain.
7. What is OS? Describe functions of operating system.

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8. Write the DOS commands to complete following tasks:
   a. Sort the directory listing, such as latest files at the top
   b. Displays any files in the current directory with .ppt as their extension
   c. Copy a Folder to Another Folder and Retain its Permissions
   d. determine which process has a file open
   e. make a new directory "BCA"

Group – C

Attempt any TWO questions. **[2 x10 =20]**

9. i) What is the use of Drop Cap in word processor? Explain major menu items of word processor.
   ii) How you can convert text to shapes in PowerPoint? How you can use Document Inspector and what is the role of it in PowerPoint presentation?
10. i) What is protocol? Describe FTP, HTTP and TCP protocols with their uses. [5]
    ii) What is application software? How it is differ from system software? Describe features of good application software. [5]
11. i) What is big data? Compare big data and data warehouse. [1+4]
    ii. Write short note about following: [2.5+2.5]
    - E-Payment
    - E-Governance

MODEL SET 5

Group– A

Attempt all the questions **[10 x1=10]**

1. Circle (O) the correct answer in the following questions

i. UNIX is a:
   a. Word Processing Program b. Database
   c. Operating System d. RAM

ii. All computers must have:
   a. Word Processing Software b. A printed attached
   c. An Operating System d. A virus checking program

iii. Which one of the following is the most popular Operating System (OS) for pc?
   a. Apple MAC OS X b. Microsoft Windows
   c. DOS d. Fedora

iv. Laser printer is a type of……
   a. Impact printing b. Non impact printing
   c. Both of above d. None of above

v. CD-ROM stands for
   a. Compactable Read Only Memory
   b. Compact Data Read Only Memory
   c. Compactable Disk Read Only Memory
   d. Compact Disk Read Only Memory

vi. Which of the following is a part of the Central Processing Unit?
   a. Printer b. Key board
   c. Mouse d. Arithmetic & Logic unit

vii. First page of Website is termed as:…
   a. Homepage b. Index c. JAVA script d. Bookmark

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viii. Which of the following is not anti- viruses' software?
a. NAV b. F-Prot c. Oracle d. McAfee

ix. The first computers were programmed using.....
a. assembly language b. machine language
c. source code d. object code

x. What is the name of the display feature that highlights are of the screen which requires operator attention?
a. Pixel b. Reverse video
c. Touch screen d. Cursor

Group 'B'

Attempt any SIX questions **[6 x5 =30]**

2. What is communication protocol? Discuss the OSI model with its layers.
3. What is data model? How ER model can used to create conceptual data model? Explain with example.
4. What is the use of secondary storage? Describe structure of hard disk.
5. Describe World Wide Web and its Evolution? Describe architecture of Web.
6. What is software? Describe types of software with suitable example.
7. Describe anatomy of a digital computer.
8. Write the DOS commands to complete following tasks:
   a. Display all files and folders of drive E:
   b. Displays any files in the current directory with .pdf as their extension
   c. Copy a file abc.txt to folder "BCA"
   d. Create a folder
   e. Change directory from C: to D:

Group – C

Attempt any TWO questions. **[2 x10 =20]**

9. i) Text entered into the word processor will automatically flow from one line to the next. Name the function of the word processor that does this. And explain. 5
   ii) What is the use of PowerPoint? How you can add bookmark to the video in Power Point?
10. (i) What is Client/Server Technology? Describe internet as a Client/Server Technology. [5]
    ii) What is open source operating system? Describe their advantages and disadvantages. [5]
11. i) What is the user of browsers? List out types of browsers used in computer system and explain. [1+4]
    ii. Write short note about following: [2.5+2.5]
    - E-commerce
    - Virtual reality

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MODEL SET 6

Group 'A'

Attempt all the questions **[10 ×1=10]**

1. **Circle (O) the correct answer in the following questions**

i. Maximum length of DOS command using any optional parameter is
   a. 26 characters b. 87 characters
   c. 127 characters d. None of above

ii. CHKDSK command is used to
   a. Analyze the hard disk error b. Diagnose the hard disk error
   c. Report the status of files on disk d. All of the above

iii. A computer program that translates one program instructions at a time into machine language is called.....
   a. Interpreter b. CPU c. Compiler d. Simulator

iv. A small or intelligent device is so called because it contains within it a
   a. Computer b. Microcomputer
   c. Programmable d. Sensor

v. A fault in a computer program which prevents it from working correctly is known as
   a. Boot b. Bug c. Biff d. Strap

vi. Laser Jet Printer speeds are measured in pages per minute (PPM), what do we use to measure dot-matrix printers?
   a. Lines per inch b. Lines per sheet
   c. Characters per inch d. Characters per second

vii. Which of the following have the fastest access time?
   a. Semiconductor Memories b. Magnetic Disks
   c. Magnetic Taps d. Compact Disks

viii. Which printer is very commonly used for desk to publishing?
   a. Laser Printer b. Ink jet printer
   c. Daisy wheel printer d. Dot matrix printer

ix. Which of the following are characteristics of peer to peer networking?
   a. Limited number of computers involved
   b. Computer acting as both a client and a server
   c. Centralized security and admin
   d. Both A and B

x. Which of the following devices send and receive information from other devices?
   a. Parallel port b. Serial port
   c. Video port d. Both A and B

Group– B

Attempt any SIX questions **[6 x5 =30]**

2. What is computer system? Discuss components of computer system.
3. What is Big Data? How centralized database is different than the distributed database?
4. How many numbers of bits equivalent 1 kilobyte? Discuss the working mechanism of magnetic tape.
5. Classify the digital computer on the basis of size.

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6. Define hard-copy and soft-copy output. Differentiate between impact and non-impact printers with example
7. What is PC computer? How it is differ from minicomputer? Describe their characteristics.
8. Write the DOS commands to complete following tasks:
   a. Display your IP address
   b. Hide folder "BCA" for D: drive
   c. Delete all contain form screen of DOS
   d. Format D: drive of your computer
   e. Unhide hidden folder "BCA"

Group – C

Attempt any TWO questions. **[2 x10 =20]**

9. i) What is the use of table in word processor? Explain drawing, inserting new rows or columns, deleting rows or columns, modify structure of the table with suitable example. 5
   ii) What is the use of excel? What is cell in excel? Describe use of macro recorder.
10. i) Explain Database Management System. What are the characteristics of data in the database? Explain services provided by database Management System. [5]
    ii) What is assembler? How it is differ from compiler? Describe their purpose in programming languages. [5]
11. i) What is the proxy server? Describe use of web servers with their applications. [1+4]
    ii) Write short note about following: [5]
    - Computer Graphics
    - Big data
    - Bit coin

MODEL SET 7

Group 'A'

Attempt all the questions **[10 x1=10]**

1. **Circle (O) the correct answer in the following questions**

i. World has become a global village because of.....
   a. information technology b. networking
   c. chatting d. transferring information

ii. Devices which are used to receive data from central processing unit are classified
   a. output/input devices b. digital devices
   c. signaled devices d. output devices

iii. All of following are non-volatile memory except
   a. ROM b. PROM c. flash memory d. RAM

iv. A nibble is composed of
   a. 8 bits b. 4 bits c. 2 bits d. 6 bits

v. What operating systems do...?
   a. Help computer work with input and output devices
   b. Help other software programs work on the computer
   c. Helps people organize and find programs and files
   d. Displays icons that, when clicked, allow you to operate software and hardware

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vi. Which one of the following protocol is not used in internet?
a. HTTP b. DHCP
c. DNS d. None of the mentioned

vii. Which protocol assigns IP address to the client connected in the internet?
a. DHCP b. IP
c. RPC d. none of the mentioned

viii. Which input method is used mainly by banks for processing cheques?
a. OMR b. Bard code reader
c. Light Pen d. MICR

ix. iPad is an example of
a. Smart phone b. Tablet
c. Laptop d. All of the above

x. What allows you to print on both sides of the printers?
a. Fuser b. Duplexer
c. Toner d. Paper swapping unit

Group– B

Attempt any SIX questions **[6 x5 =30]**

2. What is digital computer? How it is differ from analog computer? Explain.
3. What is data mining? Describe stapes involved in data mining. Also write down the functions of data mining.
4. What is wireless network? Explain Bluetooth, wireless LAN and Wireless WAN.
5. Write down the applications of Information Technology.
6. What are Networking Devices? Describe various networking devices used in computer network.
7. What are the application areas of computer? Explain.
8. What are the current available antivirus programs? How do I remove a virus and malware from my computer?

Group – C

Attempt any TWO questions. **[2 x10 =20]**

9. i) Use following table to write formula for the following questions:

S.N.	Name	Salary	Tax			Net Salary
			Service	Income	Total	
1	Ram Sharma	250000				
2	HariKhadka	350000				
3	Sita Shrestha	100000				
4	Kumar Tamang	400000				

a. Prepare above worksheet
b. Fill appropriate formulas in 'service tax', 'income tax', 'total tax' and 'net salary' and copy the formula to complete the worksheet.

Where,
Service tax=1% of salary of all yearly income tax
0, if yearly salary is less than 2 lakhs
15%, if yearly salary is between 2 lakhs to 3 lakhs
20%, if salary is above 3 lakhs
Total tax: service tax + Income tax
Net Salary; Salary -total tax

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ii) What is the use of DOS? List out internal and external DOS commands and explain briefly.

10. i) Explain data, database, DBMS, data warehouse, data mining and big data. [5]

ii) What is operating system? How multi tasking operating system differ from multi processing operating system? Explain. [5]

11. i) What is the use of web browser? List out the possible web browser used in PC and explain briefly with their attractive features. [1+4]

ii) Write short note about following: [5]

- Fact table
- Data warehouse
- Data mining

MODEL SET 8

Group 'A'

Attempt all the questions **[10 x1=10]**

1. Circle (O) the correct answer in the following questions

i. What is a common language that computers use to talk with one another on a network?
a. Client b. Adapter c. Protocol d. Operating Systems

ii. Which of the following devices send and receive information from other devices?
a. Parallel port b. Serial port
c. Video port d. Both A and B

iii. During the normal PC boot process, which of the following is active first?
a. RAM BIOS b. ROM BIOS
c. CMOS d. Hard disk information

iv. Which of the following chips can be reprogrammed with special electric pulses?
a. EPROM b. PROM c. ROM d. EEPROM

v. What type of resource is most likely to be a shared common resource in a computer Network?
a. Printers b. Speakers
c. Floppy disk drives d. Keyboards

vi. Microprocessors as switching devices are for which generation computers
a. First Generation b. Second Generation
c. Third Generation d. Fourth Generation

vii. Bob is taking up digital photography, and he wants a printer that enable him to print his photos, with the best results. What printer would you recommend?
a. Dot matrix b. Laser c. Dye Sublimation d. Impact

viii. Which is not a font style?
a. Bold b. Superscript c. Italic d. Regular

ix. The use of computer work stations to send and receive messages is known as
a. electronic funds transfer b. electronic message switching
c. electronic mail d. electronic publishing

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x. What is true about super computers?
   a. they can fit on a single small chip
   b. they are found at thousands of places around the world
   c. they cost only few thousand rupee
   d. they can process billions of operations in a second

Group– B

Attempt any SIX questions **[6 x5 =30]**

2. What is the use of GIS? What are the functional components of GIS? Explain.
3. Differentiate between database and data warehouse. Explain data mining process.
4. What is operating system? What are the advantages of Multiprocessing or Parallel System?
5. Write down characteristics of different generations of computer.
6. What is multimedia? Describe various multimedia devices.
7. What are the application areas of computer? Explain.
8. What are the current available antivirus programs? How do we remove a virus and malware from our computer?

Group – C

Attempt any TWO questions. **[2 x10 =20]**

9. i) Use following table to write formula for the following questions:

S.N.	Name	Salary	Marital status	Tax			Net Salary
				Service	Income	Total	
1	Gita karki	250000	Married				
2	Abin saud	350000	unmarried				
3	Aarav saud	900000	unmarried				
4	Umesh dhami	400000	married				
5	Laxmi dhami	800000	married				
6	Shandhya kc	730000	unmarried				

   a. Prepare above worksheet
   b. Fill appropriate formulas in 'service tax', 'income tax', 'total tax' and 'net salary' and copy the formula to complete the worksheet.

   Where,
   Take 1% for service charge for all types of employees
   Take 1% of income tax if salary less than 350000 and marital status is unmarried
   Take 1% of income tax if salary less than greater than 350000 and less than 400000 and marital status is unmarried
   Take 10% of income tax if salary greater than 350000 in case of unmarried and if salary greater than 400000 in case of married employee.
   Otherwise give
   Total tax: service tax + Income tax
   Net Salary: Salary - total tax

ii) What is the use of following commands in DOS? Explain briefly.
   a. copy b. date c. dir d. cls e. del f. ren
   g. xcopy h. chkdsk i. format j. deltree k. scandisk l. rd
   m. md

10. i) What are the features of Database language? Define DDL and DML. [5]
    ii) What is the relationship between operating systems and computer hardware? Explain. [5]

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1. i) What is OSI Model? Explain the functions and protocols and services of each layer? [1+4]
   ii) Write short note about following: [5]
   - Virus
   - LAN
   - Block chain, bit coin

MODEL SET 9

Group A

Attempt all the questions **[10 x1=10]**

Circle (O) to the correct answer.

i. Which of the following belongs to model of computer?
   a. Digital Computer b. IBM Computer
   c. PSS/2 d. Microcomputer

ii. Which one of the following is not impact printer?
   a. Dot-matrix printer b. Drum Printer
   c. Line Printer d. Ink-Jet Printer

iii. Which of the following is non-impact printer?
   a. Dot-matrix printer b. Drum Printer
   c. Line Printer d. Ink-Jet Printer

iv. Which one of the following is not open source operating system?
   a. DOS b. Android c. Ubuntu d. NetBSD

v. Which one of the following is not SQL Database?
   a. Oracle b. MS-Acess c. MYSQL d. MongoDB

vi. Which one of the following is not a networking device?
   a. Brouter b. Bridge c. LAN d. Switch

vii. How many numbers of bits are used in IPV4?
   a. 16 bit b. 32 bit c. 64 bit d. 128 bit

viii. Which one of the following file content is not a component for multimedia?
   a. MP3 file b. BMP file c. TXT file d. BIN file

ix. Which one of the following color is used in CMYK color code?
   a. Black b. Red
   c. Green d. Violet

x. Which one of the following belongs to E-learning?
   a. E-payment b. PayPal
   c. Google Checkout d. Moodle

Group B

Attempt any SIX questions **[6 x5 =30]**

2. Define Computer. Explain the anatomy of digital computer with block diagram.
3. Define operating system. Explain the functions of operating system.
4. Define DBMS. Explain the different database models with their merits and demerits.

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5. Explain the different types of LAN topologies with their advantages and disadvantages.
6. What is WWW? Differentiate between intranet, extranet and internet with example.
7. What are contemporary technologies? Explain any two contemporary technologies with roles.
8. Write the DOS command to complete following tasks.
   a. Create sub director theory and practical inside d:/exam/
   b. Create the file name marks.txt inside theory writing the content, "Theory marks in CFA"
   c. Rename the file name marks.txt with CFAmarks.txt.
   d. Make hidden the file CFAmarks.txt
   e. Search the all files with .pdf extension

Group C

Attempt any TWO questions

9. i. you are provide following data:

Bageswori Secondary School
Surkhet
Mark-Ledger

	D	E	F	G	H	I	J	K	L	M
11	Name	Eng.	Nep	Eco	Sociology	Comp	Total	%	Result	Division
12	Gautam	56	56	76	75	68				
13	Saru	67	54	64	64	76				
14	Binod	87	65	54	59	66				
15	Ritu	45	67	56	72	85				
16	Kabindra	89	34	63	59	52				

   ii. Write the Formula in spread sheet package to calculate the following on the basis on given conditions:
   a. Calculate total marks
   b. Calculate percentage
   c. Mark the student with either "PASS" or "Fail" [Pass marks 35].
   d. Calculate the division [if percentage >=60 then First, if percentage >=45 and percentage <60 then Second, if percentage >=35 then and percentage < 45 then Third division otherwise "XXX"]
   ii. Explain the features of Font control tools in word processing package.
10. i. Define computer peripherals. Differentiate between impact and non-impact printers.
   ii. Define presentation. Write the features of good presentation package.
11. Define CMYK color model. Explain the basic tools and transforms available in Photoshop.

❑❑❑

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English–I

Syllabus

Course Title: English I (3 Cr.) Full Marks: 60
Course Code: CACS 103 Pass Marks: 24
Year/Semester: I/I
Class Load: 4 Hrs. /Week Theory: 3 Hrs., Tutorial : 1 Hr.)

Course Description

This course aims at helping students combine the knowledge of the English language with their technical knowledge with special emphasis on vocabulary acquisition and grammatical accuracy. it offers up-to-date technical content, authentic reading and listening passages covering a wide range of topics like the use of virtual reality in industry, personal computing, viruses reality in industry, personal computing, viruses and security, information systems, and multimedia. Letter-writing section offers a complete guide to writing work-related letters and comprehensive glossary of technical terms forms a useful mini-dictionary of computing terminology.

Course Objectives

The main objectives of the course are to:

- Impact effective language skills to students and enable them to use language accurately, clearly and concisely.
- acquaint students with language used in computer study through extensive reading activity,
- help them to enhance their ability to use language in a proper way with specific forces on grammatical accuracy and writing competence,
- enable students to improve work-related letter writing skills with special attention to presentation and structure, and
- familiarize them with innovation in computer science while introducing them with the language used in this field.

Course Contents

A. LEARNING THE LANGUAGE

Unit One **9 Hrs.**

I. Personal Computing
The processor
Language Focus A: Contextual Reference

II. Portable Computers
Operating System
Language Focus B: Word formation, prefixes

III. Online Services
Data Transmission
Language Focus C: Word formation, suffixes

Unit TWO **12 Hrs.**

I. Computer Software
Comparing Software Packages
Language Focus D: Making comparisons

II. Computer Networks
Network Configurations
Language Focus E: Time Sequence

III. Computer in Education
CALI.
Language Focus F: Giving Examples

IV. Virtual Reality
VR Input Devices.
Language Focus G : Classifying

B. ORGANIZING AND WRITING TEXTS

Unit Three

I. Programming and Language
C Languages
Language Focus II: Organization Information

II. Computer Viruses
Computer Security
Language Focus I : Listing

III. Computers in the office
Computer System
Language Focus J: The Passive

Unit Four **6 Hrs.**

I. Computers in Medicine
Data Storage and Management
Language Focus K: Explanations and Definitions

II. Robotics
Robot Characteristics
Language Focus L: Compound Noun

Unit Five **9 Hrs.**

I. Machine Translation
AI and Expert System
Language Focus M: Cause and Effect

II. Multi Media
Computer-to-video-conversion
Language Focus N: Making Predictions

III. Computer Graphics
24 bit Color
Language Focus O: Letter Writing

Teaching Methods

The course expects communicative language teaching (CLT). Facilitating the learning process, the instructors are expected to stimulate the students to work as per the spirit of the course and make learning a joyful experience.

Evaluation

Interval Evaluation: 40%

Attendance -5
Presentation/classroom participation-5
Writing sample-15
Mid-term test-15

Final Evaluation-62%

Comprehension
Vocabulary formation
Grammar testing
Writing of multiple forms

Prescribed Textbook

1. Boeckner, Keith and P. Charles Brown. *Oxford English for Computing*. London: Rutledge. 1993

TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

English I

TU QUESTIONS-ANSWERS 2018

Course Title: English-I — Full Marks: 60
Course No: CACS103 — Pass Marks: 24
Nature of the Course: Theory + Lab — Time: 3
Semester: I

Candidates are required to give their answers in their own words as far as practicable.

Group B

Attempt any SIX questions. **[6×5=30]**

2. What are the negative aspects of replacing human with computers?

Ans: Computer is commonly used device in many areas. It is an important system for people, especially for the people who run organizations, industry, etc. Almost all the things we know is made or run by computers. Even cars, Jets are designed on computers; traffic signals are run by computers, most medical equipment use computers. Most of the jobs today require the use of computers. All types of system have good and bad impacts but bad impact should be in minority. Though computer has brought many things for mankind, it has some drawbacks too.

The negative aspects or the disadvantages of replacing people with computers in the office are that the people retain need to develop higher skills. The lesser-skilled people become unemployed, and there are fewer jobs for unskilled people. The office becomes dependent on technology and, if it breaks down, the offices can no longer function effectively. It can take longer to train newcomers to the office to become effective in their day-to-day jobs. Moreover, it is an expensive system so people may not be able to afford it. It encourages and facilitates for data piracy. It has bad impact on job market. It may increase unemployment. There can be the chances of data stolen and hacking that destroy data. It is fast changing technology so, is required to be updated timely. Some people of society may be badly affected due to illiteracy of computers. It facilitates computer crime and cyber theft. So, we must be aware on the negative aspects of computer.

3. Write a paragraph explaining how information is processed by information system.

Ans: 'Processing Information in Information System'

Information system is an integrated set of components for collecting, storing, and processing data and for providing information, knowledge, and digital products. Information systems are used to run inter-organizational supply chains and electronic markets. For instance, corporations use information systems to process financial accounts, to manage their human resources, and to reach their potential customers with online promotions. Many major

companies are built entirely around information systems. Information processing is the acquisition, recording, organization, retrieval, display, and dissemination of information. In recent years, the term has often been applied to computer-based operations specifically. It refers to the manipulation of digitized information by computers and other digital electronic equipment, which is collectively known as information technology (IT). Information processing systems include business software, operating systems, computers, networks and mainframes. Whenever data needs to be transferred or operated upon in some way, this is referred to as information processing.

The objective of information system is to provide information to all levels of management at the most relevant time, at an acceptable level of time accuracy, and at an economical cost. The information that is processed by information system can be expressed in many different ways. Information systems are often computerized because of the need to respond quickly and flexibly to queries. The transaction processing systems capture and process internal information such as sales data, production data and stock data. These produce the working documents of the business, such as invoices and statements. Above the transaction level systems are the decision support systems which take external information (i.e. market trends and other external financial data) and process internal information (i.e. sales trends, to produce strategic plans, forecasts and budgets). Often such systems are put together with PC spreadsheets and other unconnected tools. Management system lies at the top of the hierarchy of information needs. The Management Information System (MIS) takes the plans and information from the transaction-level systems to monitor the performance of the business as a whole. This provides feedback to aid strategic planning, forecasting or budgeting, which in turn affects what happens at the transactional level. So, processing information is a complex way within the information system.

4. How are the multi-user data bases managed by a piece of software?

Ans: A Database Management System (DBMS) is a system that allows many users to have access to a database and get different kinds of information from it. It is an electronic store of data that a user builds in order to later access, review, and update particular pieces of information in a rapid and coherent manner. Database software is designed to create databases and to store, manage, change, search, and extract the information contained within them. A comprehensive database software program is sometimes called a database management system. Mainly, database software exists to protect the information in the database and ensure that it's both accurate and consistent.

The DBMS makes data stored in a database available and intelligible to the person who has asked for information. It transforms the data from machine code to something the user can understand. It allows users to ask a question in 'normal language' in order to get information from data stored in 'computer language'. *The multi-user databases are managed by a piece of software which is called database management system (DBMS).* This differentiates a database from an ordinary computer file. All requests for access to data from users are handled by the DBMS. In this way, a piece of software controls, manages, transforms and stores the data through data base management system.

5. Make a list of jobs suitable for robots, and those to be done only by humans.

Ans: Robots are artificial human. In the era of technology, robots have been used in different fields and they have made the work easier and quicker. Many of the robots in use today do jobs that are difficult as well as easy for human workers. One way of classifying robots is in terms of their similarity to human. A mobile robot is a flexible machine capable of moving freely and communicates with human. A cyborg is a humanoid having organic structures. It has some physiological similarity to human. Robots are not good at any job which requires unusual skill and which is not repetitive, e.g. washing a baby, styling a person's hair, etc. The following chart shows the list of jobs suitable for robots and for human being:

Jobs suitable for robots	Jobs done by human
Welding, e.g. machines are heavy and hard to handle for humans	**Perception and Manipulation,** e.g. finger or manual dexterity, or the necessity to work in cramped spaces/awkward positions
Spray painting, e.g. robots are not affected by poisonous fumes	**Creative Intelligence,** e.g. originality and fine arts
Carrying heavy components, e.g. will not harm or put stress on robots	**Social Intelligence,** e.g. Social perceptiveness, negotiation, persuasion, and caring for others
Assembling components, e.g. robots requires extreme accuracy only robots can be programmed to repeat actions without error	
Nuclear reactors stations and underwater, e.g. robots can work in conditions which are either dangerous or impossible for human beings	

6. What do you mean by virtual reality? How is it going to affect young people's attitude to violence?

Ans: The term 'virtual reality' has been derived from the mathematical concept of an image that has the virtues of a real object without the substance. A virtual reality system consists of a helmet with a color display in front of each eye and wide-angle lenses to cover the entire field of view and give a stereoscopic effect.

In my opinion, virtual reality has affected in young people's attitude to violence. Anything that portrays violence as fun is going to alter young people's perception of violence in a very dangerous way. Violent crime amongst young people is increasing. Likewise, playing with toy guns were invented in the world of virtual reality. Playing with toy guns in the real world is more dangerous than playing with imaginary guns in an imaginary world. At present in PUBG's case, gamers would actually be able to feel that they are behind the gun, killing off players one by one until they're the only survivor.

Virtual reality (VR)'s power lies in the fact that the subconscious cannot differentiate between reality and the simulated environment that we are seeing. Our conscious mind might be aware that we are just playing a game, but our subconscious re-calibrates itself to accept the new surroundings as real. It will initiate fight or flight and other psychological and physiological

reactions in response to a perceived threat. This is why, a VR user might duck at something that's thrown at him in the game.

VR is a technology that creates a virtual environment. It is presented to our senses so one may feel like he is actually there. A host of technologies are used to account for thought and perception. A VR headset takes over and represents visual surroundings which are similar to what headphones do with audio. Despite the game's terrible graphics and unrealistic scenery, scared playing and started crying and wanted to stop at various points are some other examples.

Thus, virtual reality may motivate towards violence young people come to see different forms and strategies of fighting from VR. So, there is the need of proper use otherwise VR technology can be a foe to the mankind.

7. **Discuss some of the applications of AI programs.**

Artificial intelligence (AI) is called machine intelligence demonstrated by machines, in contrast to the natural intelligence displayed by human. The term "artificial intelligence" is used to describe machines or computers that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving". As machines become increasingly capable, tasks considered to require "intelligence" are often excluded from the definition of AI. In the twenty-first century, AI techniques have experienced a resurgence following concurrent advances in computer power, large amounts of data, and theoretical understanding; and AI techniques have become an essential part of the technology industry, helping to solve many challenging problems in computer science, software engineering and operations research.

'Artificial intelligence' (AI) is concerned with developing computer programs that perform tasks which require intelligence when done by humans. So, AI is better at intellectual tasks. Sometimes program are intended to simulate human behavior, as in computational psychology and sometime built for technological application in the case of expert system. Some examples of using AI are: playing games, understanding natural language, forming plans, and proving theorems. The other applications of AI can be planning for garden, treating critically injured patients in emergency rooms, and using natural language front-ends in multimedia systems.

8. **What the actual or potential applications of multi-media in industry?**

Ans: Multimedia can be anything and everything which can be watched and listened in a form of text, photograph, audio, video and much more. In most of the industries, whether hospitality, aviation, banking, insurance, science and technology etc., it is being used in almost every field, either for publishing something or for some other purpose.

The areas in which the industrial sector in general and manufacturers of equipment and machinery in particular, can utilize the advantages and features of multimedia. The range of multimedia applications that emerge for an engineering or industrial product manufacturer gives advantages that a superior technology provides to the users. They are: business presentations, training of marketing executives; sales presentations, product introduction, information sessions, demonstration of functionalities of inner parts of industrial plants and machinery; erection of machinery and onsite troubleshooting; classroom training of maintenance staff; Web enabled parts catalogue and order processing; product catalogues; and recreation.

Multimedia is heavily used in the entertainment industry, especially to develop special effects in movies and animations. It is used as a way to help present information to shareholders, superiors and coworkers which is helpful for providing employee training, advertising and selling products all over the world via virtually unlimited web-based technologies. In medical industry, the availability of multimedia rich content on virtual surgery or action of particular drug on a cell helps medical practitioners in bracing themselves to prevent from any mal-practices. In this way, multimedia has become an integral part of industry.

Group C

Attempt any Two questions **[2×10=20]**

9. Write a letter of application for a job advertised in a national daily newspaper. Also, write your resume as a supporting document for the application. Follow the criteria of letter writing process.

Kirtipur – 10
Kathmandu

10 January, 2020

The Campus Chief
Ratna Rajyalaxmi Campus
Exhibition Road, Kathmandu

Ref. No.: 014

Respected sir,
Having seen your advertisement published in **The Kathmandu Post** on 15 December, 2019 for the post of English Lecturer, I wish to submit my candidacy as a qualified candidate for the post. I am interested to work in your college and applying for the post of lecturer. As a believer of work ethics, I work hard to excel in my professional field. I am very willing to learn all the aspects of innovative and dynamic mode of instructing students if given the chance.
I have completed my M. A. from Central Department of English Kirtipur. I have extensive previous experience in teaching but would like to gain a further platform to cultivate myself professionally. Since the completion of degree in English, I have been teaching English for secondary level, +2 level and bachelor level in many colleges.
With a higher sustained level of academic qualification and yearlong experiences, I am increasingly confident that I would like to promise that I would entirely abide by the norms, duties and responsibility assigned to me if the opportunity to serve your campus would be provided. I develop a class schedule that comprises daily lesson. I believe demonstrations can help students learn more. I am flexible with work timing and can guide my students whenever they need any help.
Attached is my resume giving further detail of my work history, skills, qualification and experience. I would appreciate if we could meet up for an interview and discuss on this more. You can all me at 985119404 or drop me an e-mail at kis.a11@gmail.com
I am looking forward to receiving your favorable response.
Faithfully Yours,

.....
Raj Lamichhane

CURRICULUM VITAE

Personal Information

Name	:	LAMICHHANE, RAJ
Father's Name	:	Sharma, Shiva
Permanent Address	:	Aadhikhola-4, Syangja
Correspondent Address	:	Kirtipur -16, Nayabazar, Kathmandu
Sex	:	Male
Religion	:	Hindu
Nationality	:	Nepali
Phone No	:	9851194045
Email	:	krvanja11@gmail.com
Date of Birth	:	1989-04-23
Marital status	:	Single
Objectives	:	To obtain a position as a renowned professor of English literature.
	:	To obtain a position as Nepali English translator at esteemed institute.

Academic Qualification

S. N.	Levels	Board	Major Subjects	Year
1	M.A.	T.U.	English	2010
2	B.A.	T.U.	English/Population	2008
3	I.A.	T.U.	English/Political Science	2005
4.	S.L.C.	Board of Nepal	Account/ Economics	2003

Experiences

20013-2017	:	**Translator**, ABC Institute, Kathmandu.
	:	Translating technical and non-technical official documents
2012- 2015	:	**Secondary English and Social Studies Teacher,** Surayadaya Boarding School, Kalanki Kathmandu
2016-2020	:	**English Lecturer,** Janta Multiple Campus, Nayabazar, Kathmandu

Trainings

- One day workshop for +2 level teachers in British Council
- 3 day workshop on TPD Program
- Diploma Level Computer Training (MS Word, Excel, PowerPoint, etc.)

Additional information

- Language: English, Nepali, Hindi
- Interest: Helping the helpless
- Hobbies: Reading story and novels

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Prepared by Santosh Bhandari (MEMC)

References

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- Prof. Dipak Basnet, Principal , Janta Multiple Campus, Nayabazar, Kathmandu, Mobile No. 9841732012, email basnetd@pk11@gmail.com
- Mr. Nabin Gole, Director, ABC Institute, Kathmandu, Mobile No: 984102889, email golemuskan@gmail.com

Date: ..... Signature: .....

OR Your department needs a new piece of equipment to perform work. Write a memo requesting for this equipment with a justification for its need. Follow the criteria of Memo writing.

Bindabasini College
Bagar, Kaski
MEMORANDUM

To: The Principal

From: Co-coordinator

Date: January 27, 2020

Subject: **Purchase of Three Photocopiers.**

It is notify that the Sodhi Photocopiers that we have is no longer adequate to meet all our needs. It is about nine years old and lacks versatility. Moreover, it breaks down frequently and needs major repairs. This year alone we had to spend Rs. 15,000 to keep it in working order. With the additional of four teaching departments and consequent increase in the number of both faculty and students, the volume of work has gone up considerably. Our estimates show that we now require at least three more photocopiers to cope with the present day demands. We have also studied the feature of various types of photocopiers currently available in the market. We recommend the purchase of Copra Xerox, each costing Rs. 1,70,000/- manufactured from A to Z Ltd., New Road, Kathmandu.

I request you to accord your administrative approved for the purchase of photocopiers.

Thank you,

.....

Dipak Bhandari

10. Suppose you represent the National Council for Educational Technology, and your boss has asked you to make comprehensive notes about the work of the Council. Explain in detail the work of the Council. You may write your answer in the form of a presentation to be delivered to a group of teachers.

Ans:

National Council for Educational Technology A comprehensive note about the work

By
Samyoga Sharma

The participant delegates, Teachers and all the audiences

Here, I am going to give a presentation on the works of National Council for Educational Technology. You might have curiosities on how NCET has been working. So, I have tried my best to address your curiosity in this presentation.

Presentation outline

- Introduction
- The Purpose of NCET
- Educational Technology/ Learning Technology
- Works of the Council

i. School Based
ii. Work Based and
iii. Technical expertise

Introduction

- The National Council for Educational Technology provides advice and support for schools and colleges in England, Wales, and Northern Ireland on educational technology, in particular the use of computers for teaching and learning.
- NCET was set up in 1989. The aim is to promote the use of educational technology through publications, events, TV programmes.

The Purpose of NCET

- To bring beneficial change to the processes of learning in education and training through the development and application of educational technology

Educational Technology/ Learning Technology

- Includes everything from computers, satellites, and interactive video for learning.
- Produce learning materials in all subjects to support education and training.
- Support training for trainers and teachers and offer expertise in open and flexible learning, resource management, and educational software.

Works of the Council

- School Based
- Work Based and
- Technical expertise

School Based Activities

NCET has following four priorities as the part of it works.

- To identify, promote and spread good practice in the use of new technologies.
- To provide professional guidance to teacher trainers which can help teachers and schools in managing.
- To develop high quality curriculum materials.
- To give particular support for children and adults with special educational needs.

Work Based

- NCET's Training Directorate focus on the needs of those wishing to learn after the school-leaving age.
- The Vocational Training programme helps women, older workers, and those who use information technology to work from house.

Technical expertise

- This council identifies issues associated with the adoption of new technologies such as satellites, CD-ROM and interactive video and carries out projects to develop their potential in education and training.

Thank You!

11. Write the summary of the text "Computer Network".

Ans: Computer networks link computers locally or by external communication lines and software protocols, allowing data to be exchanged rapidly and reliably. The distinction between local area and wide area networks is, however becoming unclear. Networks are being used to perform increasingly diverse tasks, such as carrying email, providing access to public databases, and for distributed system. Networks also allow users in one locality to share resources.

Distributed system use networked computers. Similarly, PCs or workstations provide the user screen handling. Mainframe process queries and returns the results to the users. A user at his PC might make a query against a central

database. The PC passes the query, written in a special language, to the mainframe which then parses the query, returning to the user only the data requested. This allows both the network and the individual PC to operate efficiently.

In the 1980s, at least 100,000 LANs were set up world-wide. As synchronous orbit satellites have lowered the price of long-distance telephone calls, data can be transmitted more cheaply. In addition, fibre-optic cable has been installed on a large scale, enabling vast amounts of data to be transmitted at a very high speed using light signals. This will considerably reduce the price of network access, making global networks more and more a part of our professional and personal lives. Networks should also improve our work environments and technical abilities. In this way, the text computer network provides what networks are and how they operate.

OR

Mary Evans, Gerry Hasper, Matt Andrews and Bob Bolton are well known software developers. Do they think software purchases are getting what they need? What are their views about giving a better product to purchases?

Software technology is getting more complicated; Mary Evans, Gerry Hasper, Matt Andrews and Bob Bolton are well known software developers. These four well- known software developers have to cut through a jungle of computer languages, operating environments and shifting standards to choose how they will create their software. However, it is not easy task, software buyers will have to live with the result for years to come. The software developers think that the software purchases are getting what they need. In their views, the developers are now working for giving better product to purchases.

In Mary Evans' opinion, customers are getting what they want. There are a lot of creative things being done with paint software, word processing, desktop publishing (DTP) systems. The computer is an incredibly powerful tool and any software that make it easier, faster, more creative or more cost-effective. She says that he is optimistic about the way things are going at the moment and most of the major software manufacturers are able to understand the market well.

Gerry Harper's idea is that they are not getting the technical support they need. While the products are getting more complex and expensive; it seems that support is starting to be thought of as an additional business opportunity. The applications are getting too big. They are versatile and powerful and overwhelming.

Matt Andrews opines that suppliers know what their customers want and they just can't supply it quickly enough. Purchasers' need seem always to exceed the capability of the available software by a constant time frame of nearly six to twelve months.

Likewise, Bob Bolton argues that the users are getting what they want and provided that their needs fit the off-the shelf application. Software should be written in house for business. Developers should add features that the customer needs but not what they think customers want. Some effort should be made to get feedback from the users before making an upgrade so that the proper features are added.

TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

TU QUESTIONS-ANSWERS 2019

Course Title: English-I — Full Marks: 60
Course No: CACS103 — Pass Marks: 24
Nature of the Course: Theory + Lab — Time: 3
Semester: I

Candidates are required to give their answers in their own words as far as practicable.

Group A

Attempt all the questions. **[10×1 = 10]**

1. Circle (O) the correct answer.

i. Icon is defined as .....
   a) visual symbol used in a menu instead of natural language.
   b) a device moved by hand to indicate position on the screen.
   c) data programs
   d) The set of software

ii. An ..... pen is one example of an input device.
   a) electron b) electronic
   c) electronics d) electronically

iii. The word computational has .....
   a) an adjective-forming suffix b) adverb-forming suffix
   c) verb-forming suffix d) noun-forming suffix

iv. Newest is an example of .....
   a) superlative adjective b) comparative adjective
   c) absolute adjective d) absolute adverb

v. We were ..... to document our program.
   a) instructor b) instructed
   c) instruct d) instruction

vi. The opposite meaning of 'preventing' is .....
   a) co-operating b) enabling
   c) reducing d) localizing

vii. Which of the following words has a destructive meaning?
   a) cipher b) shield
   c) smart-card d) hacker

viii. The computer is ..... faster than the old one.
   a) considered b) considerably
   c) considerable d) considering

ix. Our company is working on a new ..... of software products.
   a) generation b) generative
   c) generated d) generate

x. The similar meaning (synonym) of the word inventive is .....
   a) Skilled b) creative
   c) awkward d) insufficient

Answers Key

i. (a)	ii. (b)	iii. (a)	iv. (a)	v. (b)	vi. (b)	vii. (d)	viii. (b)	ix. (a)	x. (b)

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Prepared by Santosh Bhandari (MEMC)

Group 'B'

Attempt any SIX questions. **[6×5=30]**

2. What are the major functions of the decision support system? Explain.

Ans: Decision Support System (DSS) is a set of manual or computer-based tools that assists in some decision-making activity. In today's business environment, decision support systems (DSS) are commonly understood to be computerized management information systems designed to help business owners, executives, and managers resolve complicated business problems or questions. Good decision support systems can help business people perform a wide variety of functions, including cash flow analysis, concept ranking, multistage forecasting, product performance improvement, and resource allocation analysis. Previously regarded as primarily a tool for big companies, DSS has in recent years come to be recognized as a potentially valuable tool for small business enterprises as well.

Gupta, Jatinder and Thomas Harris in their Decision Support Systems for Small Business *"Journal of Systems Management"* published on February 1989 observed that DSS is predicated on the effective performance of three functions, like: information management, data quantification, and model manipulation. Hence, "Information management" refers to the storage, retrieval, and reporting of information in a structured format convenient to the user. Data quantification, on the other hand, is the process by which large amount of information is condensed and analytically manipulated into a few core indicators that extract the essence of data. Likewise, Model manipulation refers to the construction and resolution of various scenarios to answer 'what if' questions. It includes the processes of model formulation, alternatives generation and solution of the proposed models, often through the use of several operations research/management science approaches. So, decision support system has three broad functions as: IM, Data quantification and model manipulation.

3. How has the micro-chip technology changed the world forever? Illustrate.

Ans: The micro-chip is pervasive and ubiquitous in our lives more than we realize. One of the enablers that have really transformed our lives in the last 40 years was being the successful development of semiconductors or microchips. It has gone from being an incredibly simple device that was used in the early days of microchips people that advertised a two transistor radio, a three transistor radio. And because they were replacing what used to be called tubes. But then, the industry moved very rapidly towards integration. So, we created the integrated circuit soon after we created the microprocessor. And all of that just exploded in terms of the applications that they went into. It is estimated today that the people from the time they wake up in the morning to the time they go to bed get somehow exposed and touch something on the order of 500 microprocessors. So, we can think of it as touching 500 computers. We're probably not aware we did that but, every time we get in our car which can potentially have in excess of 100 microprocessors in the automotive electronics. So, it's around us everywhere. Our phones, our laptops, our iPads – all of those things we're now surrounded by this technology. And the impact upon the world made by it has been enormous.

The widespread availability of computers has in all probability changed the world for ever. The microchip technology which made the Personal computer (PC) possible has put chips not only into computers, but also into washing machines, cars, books, etc. Some books may not be published in paper form, but may be made available as a part of public databases. Networks of computer are already being used to make information available on a world-wide scale. These all cases show that the micro-chip technology has become a catalyst of change in the world.

4. Give the meaning of "network of networks" and then explain the main use of ALGOL.

Ans: The Internet is often described as a network of networks. Some include the Connecting devices that are the connectors to join one part of the larger network to another. Connecting devices differ in complexity of the connection they provide, but they all contribute to the rapid movement of data that is the key to the Information Age. Computers can deal with different kinds of problems if they are given right instructions for what to do. Instructions are first written in one of the high-level languages, e.g. FORTRAN, COBOPL, ALGOL, PL/I, PASCAL BASIC, C and API.

ALGOL is an acronym for ALGorithmic Language called International Algebraic Language (IAL). It is a family of portable programming languages for scientific computations developed in the mid-1950s that had a strong influence than those of many other languages. Additionally, ALGOL was used as the standard method for creating algorithms by the ACM (Association for Computing Machinery) in textbooks and academia. It is used for mathematical and scientific purposes. It was first introduced in Europe in 1960.

There were three major specifications, named after the years they were first published:

- ALGOL 58 – originally proposed to be called *IAL*, for *International Algebraic Language*.
- ALGOL 60 – first implemented as *X1 ALGOL 60* in mid-1960. Revised 1963.
- ALGOL 68 – introduced new elements including flexible arrays, slices, parallelism, and operator identification. Revised 1973.

ALGOL has made the network of networks possible. Since internet has connected everything of the world together it has been taken as network of networks.

5. Give some specific names of clip board computers now available in the market and then explain the two different jobs of 'infector' and 'detonator'.

Ans: The clipboard is portable board with a clip at the top for holding papers. The clipboard is also known as pasteboard which is a special location in computer's memory that temporarily stores data that was cut or copied from a document. It will hold its information until cut or copy something else, or log out of the computer. The names of clip board now available in the market are GRIDPad, Sony's Palmtop and Canon's AI Note.

An infector is something which transmits a disease or virus. It means, it inserts malicious code into executable files — files used to perform certain

functions or operations on a system. The part of virus first copied somewhere before the detonator part damages the data on disk. Detonator is a device used to set off an explosion or other destructive process. It erases a vital part of hard disk, making the files on that part of the disk no longer accessible. It works by interfering in some way with the normal use of the computer.

6. **Why did the developers of the PAL system invent interlaced video? What are its advantages and disadvantages? Explain.**

Ans: The interlaced video Phase Alternating Line (PAL) is television terminology system. It is used to describe a color encoding system that is used in broadcast television systems in most parts of the world. There was not enough bandwidth to transmit all 625 lines of one TV image in a fiftieth of a second. The advantage is that it eliminates the flicker for viewing from several yards, but for close-up viewing it could cause a headache.

Advantages of PAL TV systems are related to 625-line/50 Hz television systems. PAL TV systems are predominant in Europe. DVDs that can be played on these systems are accordingly labeled as 'PAL'. There is a greater number of scan lines within a PAL system this means more picture detail. It's decoder adds color signals of successive lines while canceling out phase errors. Nowadays, the PAL TV system is the most common and prevalent television system found in more than 65 countries because of it excellent color stability. There are different brands of PAL TV systems available today; it is up to choosing the best brand and model we want depending on our budget and our entertainment requirements. The advantages of PAL system are following:

- Greater number of scan lines – more picture detail.
- Wider luminance signal bandwidth (4.43 MHz in most PAL variants)
- Stable hues – due to error correction by phase alternation
- Higher gamma ratio (2:8) – hence, higher level of contrast
- Easy studio mixing compared to SECAM

Likewise, the disadvantages or some problems in using PAL are given below:

- Costliest receivers due to complex circuits for electronic switching.
- Lower frame rate – hence, more flicker.
- Lower S/N ratio than NTSC.
- Variable color saturation – cancelling out phase differences by alternation holds hue stable but at the same time, it can change (reduce) color saturation

7. **"Computers are about to take people to places they have never been able to visit before." Explain the statement basing on the essay "Fancy a fantasy Spacecraft?"**

Ans: Of course, computers are about to take people to places they have never been able to visit before, i.e. including the surface of other planets. This phrase comes closer to real life than anything on stage or screen. Artificial worlds are being built up in a computer memory so that people can walk through at will, look around, and even touch an object which is called virtual reality. It is an image that has the virtues of a real object without the substance.

Virtual reality systems are being developed throughout the world for a range of uses including enabling people to walk 'inside' nuclear power stations, while controlling a robot that actually goes into an area in which no human could live and conducting architects through a computer-generated building before it is constructed.

British scientists have a world lead in virtual reality which sees it as a technology for the next century. Robert Stone, of the National Advanced Robotics Research Centre at Manchester University, is developing systems that could put men on Mars without shooting them into space and could plunge divers under the North Sea without taking them out of the office.

As for example, a virtual reality system consists of a helmet with a color display in front of each eye, and wide-angle lenses to cover the entire field of view and give a stereoscopic effect. The helmet contains sensors, rather like electronic compasses, to record where it is pointing. A computer calculates what the wearer should be seeing in that direction and displays it on the screen. The helmet has a pair of liquid crystal displays with wide-angle lenses giving a stereoscopic image, and a set of magnetic sensors to tell the computer what the helmet is looking at as it moves.

In more advanced systems, the operator wears an electronic glove that detects exactly what the fingers are doing and transmits the information to the computer. If the user tries to pick up something, the computer will make the object follow the hand to give the illusion of carrying it. Pads in the latest type of gloves press into the insides of the fingers and palm when an object is encountered, to create the illusion of feeling it. However, complete 'exoskeletons' covering the user and allowing the computer to simulate almost anything possible in real life are still in the laboratory.

Similarly, a fire-fighter in a nuclear power plant, for example, would move through a computer model wearing an exoskeleton, while a robot would move through the real thing. The computer program will be derived from the data used to design the plant in the first place. The first game is a fighter simulation. Another is based on a sequence in the film, Return of the Jedi, in which flying motor-cycles race through a forest. The computer can link and control several helmets at once for a group game.

Mr. Stone has developed a data glove with air pockets that are inflated to give a sensation of touch in collaboration with Air-muscle, the supplier of the pneumatic systems that made the Spitting Image puppets really spit. The biggest initial market is likely to be for a new generation of video games. W Industries, of Leicester, recently launched a virtual reality system for video arcades. The system, called Virtuality, consists of a cockpit in which a player sits, wearing the helmet, at a set of controls that can mimic bobsleigh, a space-ship, or whatever the imagination of the games programmer can devise.

In this way, the use of computers in different activities and aspects has made even impossible things to possible and computers are about to take people to laces they have never been able to visit before.

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8. Discuss some of tasks /jobs suited to robots only, and show the impact of robotics revolution felt in modern society.

Ans: Robot is an artificial man that works with artificial intelligence. Roberts support mankind in a number of ways. Some of them are as follow:

a. **Welding-** It is a function in which robots support significantly because machines are heavy and difficult to handle for humans

b. **Carrying components-** Similarly, robots do the job of carrying components in different places within a limited period of time.

c. **Spray painting-** Robots are equally used for spray painting as they are not affected by poisonous fumes, robots don't need to breathe

d. **Assembling components-** Robots require extreme accuracy; they can be programmed to repeat actions without error

e. **In nuclear reactors and underwater-** Robots are fitted with video cameras and sensing devices that can notice heat, texture, size and sound, it can work in conditions which are either dangerous or impossible for human beings.

In the modern society, the impact of robotics revolution felt that the boring and dangerous jobs are now assumed by it. More and more humans will be required for tasks that machines cannot do. All the employees will be knowledge workers, no longer standing on assembly lines but rather sitting at desks and computer terminals to deal with information. However, robots may reduce the task efficiency of human beings.

Group C

Attempt any Two questions. **[2×10=20]**

9. Perhaps you manage a computing specializing in multi-media hardware and software. Prepare a leaflet to inform companies of the potential benefits of using multimedia.

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OR

Write a letter of inquiry to a college or university requesting information about a degree program. Be specific in your request, and follow the criteria for writing letters of inquiry.

Kirtipur-16 Kathmandu
Phone: 9849003452

Munamadan College
Bagabazar, Kathgmandu

Date: 7 January, 2020

Subject: Inquiry for information about degree program

Dear Sir,

I am interested in applying to Munamadan College for admission to the first year of degree program in English literature. I have passed the Bachelor's degree examination with distinction and I am interested to do my master in English literature.

Please send me any information you have about the English literature department. I'm specifically interested in learning more about:

- Admission requirements
- Faculty biographies and credentials
- Department area of specialization
- Availability of grants and scholarships

Please send me the information at the address listed above. If you have question about my request, please contact me by mobile at 9851198675 or by email at sarukoirala@gmail.com.

Thank you for considering my request.

I look forward to hearing from you soon.

Sincerely
……..
Saru Koirala

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10. **You work in the purchasing department of an industry where a ma project is being introduced at work. Employees working under yo supervision need suggestion from you. Write a memo providing yo response in regard to their individual responsibilities.**

SUCCESS INDUSTRY AND SUPPLIERS
Kirtipur, Kathmandu
MEMORANDUM

To: All Employees
From: The Manager
Date: 12 January, 2020

Subject: Suggestions on Individual Responsibilities

I am writing to inform you that, a few days ago, I was looking all the employees wor But I found that all of you are not dedicated in your work and not in on duty. You a spending your time on playing games in Google or mobile for hours and hours, n sitting in your own seat and backbiting about other staff who were absent.

So, I request that you all of employees should be punctual on time, keep materia and things in proper place, sit in your own seat, not talk about others and shoul inform all the customers what they want to know. It means you should give th information about companies to our customers.

I encourage a fun and competitive environment. This is just a reminder to b careful with your use of company time.

Thank you,

.....

Mohan Prasad Pandey

OR

Write a complete CV of your own to be sent with the covering letter whil applying for a job.

Kirtipur – 10
Kathmandu
10 January, 2020
The Campus Chief
Madan Bhandari College
Baneshor, Kathmandu

Respected sir,

I have come to know from your advertisement published in **The Himalayan Times** on 07 December, 2019 for the post of English Lecturer, I wish to submit my candidacy as a qualified candidate for the post. I am interested to work in your college and applying for the post of lecturer. I have completed my M. A. from Central Department of English Kirtipur.

Attached is my resume giving further detail of my work history, skills, qualification and experience. I would appreciate if we could meet up for an interview and discuss on this more. You can all me at 985119404 or drop me an e-mail at yogusharma11@gmail.com

I am looking forward to receiving your favorable response.

Faithfully Yours,

.....

Yoga Raj Sharma

Note: See the resume given in T.U. 2018, (Group C, Q. No. 18) and do write your own following.

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Write an essay about a problem that directly involves you. Choose a problem you see in your neighborhood, your college, or your job, and explain how it should be solved.

Keeping Children Safe at Home

The problem I saw in my community that directly hints me is that Children are more suffer in their lives by various causes or reasons. Everyone has dream of growing up, getting married, having children and raising them in a great neighborhood. They all want to believe that their children are safe in their homes.

People have faith in everyone around them, that everyone is "just like them" and would not hurt anyone. Having children should make them more cautious and aware of their surroundings. Everyone should always be prepared for the worst things that can happen whether or not they do happen. One issue that many neighborhoods have is the fact that so many strangers drive around and are near the children in that area. Having strangers in a safe, family neighborhood has often led to dangerous break-ins. By adding that little bit of security, and "shutting out" the strangers would make the homeowners and children feel safer since not just anyone can come into their neighborhood.

The challenges parents face is managing difficult or disobedient behavior on the part of children. Whether they're refusing to put on their shoes, or throwing full-blown tantrums. Children who were exposed to violence in the home engaged in higher levels of physical bullying than youngsters who were not witnesses to such behavior. Outside of the house, children can go in the neighbor house and they can damage anything what their neighbor have. Likewise, the neighbor can scold or beat to the children. There can be also quarrel among the neighbor in the name of children. There is not good relation among them So, parents should keep their children inside the home safety is about supervising the children, creating a safe environment, and teaching the children about what is safe and what is not. Likewise, parents can do a lot to avoid common home injuries like falls, burns and scalds, poisoning, drowning, strangulation and suffocation. In the same way, if the child is injured, it's important to know basic first aid and CPR so parents can care for the child until medical help arrives.

Adding a gate would not keep every bad thing or person out, but it would decrease the chances of anything severely bad from happening. An alternative option to make the parents feel safer with their kids in their neighborhood would be adding security cameras on every home. Financially, this would cost more than the gate itself; however it would be very practical in case a break-in occurs again. This would be a great tool that the police could use for finding the criminals. Security cameras are a great way of recording everything that happened but also are a way of keeping people out. If people knew they were

being watched or even sensed it, they would not do half the things th already do.

By adding cameras it could scare people away so they do not continually what is wrong. Once again, just like adding a gate there wouldn't be guarantee that this would prevent all bad things from happening; but, it cou prevent some things and make the families feel safer. There are many ways ensuring that people feel safe in their neighborhood. By adding securio cameras or a gate at the entrance, people can increase the safety of their kids o home.

Parents are very powerful role models and children will mimic the behavi of parents, wanting to be like them. They may believe violence is OK an they can use it with peers. After all, they may think, If Daddy can do thi perhaps I can hit this kid to get my way. When parents engage in violenc children may assume violence is the right way to do things. In this way th parents should care about their children and should keep their relation goo with neighbor.

❑❑❑

MODEL QUESTIONS SETS FOR PRACTICE

MODEL SET 1

Course Title: English-I
Course No: CACS103
Nature of the Course: Theory + Lab
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3

Group A

Attempt all the questions. **[10×1 = 10]**

Circle (O) the correct answer.

Mouse is defined as .....
a) Visual symbol used in a menu instead of natural language.
b) A device moved by hand to indicate position on the screen.
c) Data programs
d) The set of software

i. The computer is the greatest ..... invention of the twentieth century.
a) technology b) technological
c) technologically d) technologist

ii. The word electronically has .....
a) an adverb-forming suffix b) verb-forming suffix
c) an adjective-forming suffix d) noun-forming suffix

iv. Sooner is an example of .....
a) absolute adverb b) comparative adverbs
c) absolute adjective d) superlative adjective

v. The opposite meaning of 'disparate' is .....
a) enabled b) co-operated
c) reduced d) localized

vi. The similar meaning (synonym) of the word inventive is .....
a) Skilled b) creative

vii. Which of the following words has a protective meaning?
a) infect b) signature

viii. The company has supplied us ..... for over ten years.
a) depending b) dependent
c) dependable d) dependably

ix. Those files are not ..... unless you know the password.
a) accessibility b) accessed
c) accessible d) access

x. The similar meaning (synonym) of the word proficient is .....
a) Skilled b) creative
c) awkward d) insufficient

Group B

Attempt any SIX questions. **(6×5=30)**

2. In what ways are computers used at home or outside Work?
3. What is LAN and WAN?
4. Make a list of the ways computers are used in education.

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5. Make a list of all the applications of computers which are related in medicine and patient care.
6. What does the expert system ROI do?
7. What are the main differences in the way images are produced on a TV screen and on a computer screen?
8. What do you think the photograph was used for and how was the image achieved?

Group C

Attempt any Two questions. **(2×10=20)**

9. Virtual reality is still seen as a toy by most people. Can you think of any potential applications of VR other than in computer games? Make a list.

Or Write an advertisement for a real or imaginary notebook computer. Your material should include its name and type, its size, price, and capacity and the features that make it superior to other models.

10. Write a **Memo** to the executive committee members of Nepal Judicial Council inviting them to attend the annual function of the council.

Or Make an effective leaflet of ABC restaurant

11. Write the summary about the structure of the processor.

MODEL SET 2

Group A

Attempt all the questions. **[10×1 = 10]**

1. Circle (O) the correct answer.

i. Pixel is defined as .....
   a) electrical force
   b) individual dot on a computer screen
   c) network of lines crossing at right angles
   d) surface on which pictures or data are shown

ii. The word helpful has.....
   a) an adverb-forming suffix b) an adjective-forming suffix
   c) noun-forming suffix d) verb-forming suffix

iii. Our math's..... explained to us the principals of binary arithmetic.
   a) Instructor b) instruct c) instructed d) instruction

iv. The package includes an..... booklet.
   a) explain b) explanatory c) explained d) explaining

v. What is the synonym of inventive.....
   a) deduce b) take part in c) depressed d) creative

vi. Our company is working on a new ..... of software products.
   a) generation b) generative c) generated d) generate

vii. Which is the material noun.....
   a) computer programming b) a silicon chip
   c) an input device d) a computer keyboard

viii. She tried to escape..... by disguising herself.
   a) detect b) detectable c) detective d) detection

ix. The similar meaning of 'sure to' is .....
   a) bunch to b) black art c) bound to d) blithely

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x. Emulsion is defined as .....
   a) light-sensitive substance on the surface of film
   b) Succeed in representing on film
   c) Alter by making minor changes
   d) Device that uses compressed air to spray paint

Group B

Attempt any Six questions. [6×5 = 30]

2. In what ways are computers used these days at home and outside work?
3. What is magnetic card reader? How does it work?
4. Write an advertisement for a real or imaginary notebook computer. Your material should include its name, type, size, price, capacity and the features that make it superior to other models.
5. What is an operating system and what is its purpose?
6. How does digital transmission differ from analog transmission?
7. Explain the following types of network configurations: Star, Bus/ Ethernet.
8. Explain what these programming languages mean: COBOL, BASIC and C.

Group C

Attempt any Two questions. [2×10=20]

9. Write a letter of application for a job of your choice advertised in the Katmandu Post. Also write a complete CV of yours as a supporting document for the application.

OR

Write a letter of inquiry to a company about a new software package you want to purchase for your office. Follow the criteria for writing letter of inquiry.

10. Write a summary of the text 'Computer Network'.
11. Write an essay on 'The Internet: how it changes our life'.

MODEL SET 3

Group A

Attempt all the questions. [10 x1=10]

1. Circle (O) the correct answer.

i. Binary is the.....
   a) prefixes of numbers b) prefixes of location
   c) prefixes of size d) prefixes of time and order

ii. The negative word of specific by adding prefix is.....
   a) in b) im c) un d) dis

iii. What is the correct the spelling of egguanal
   a) language b) module c) code d) tape

iv. What is the opposite meaning of disparate.....
   a) enable b) reduce c) vast d) localized

v. What is the synonym of achieve.....
   a) exceed b) accomplish c) shift d) feedback

vi. Which word has destructive meaning
   a) hacker b) cipher c) virus scanner d) password

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vii. This computer is .....than the old one.
a) consider b) considered c) considerably d) consideration

viii. Circle the word that is different.....
a) FORTRAN b) COBOL c) PASCAL d) ASSEMBLER

ix. Capture is defined as .....
a) light-sensitive substance on the surface of film
b) Succeed in representing on film
c) Alter by making minor changes
d) Device that uses compressed air to spray paint

x. What is the meaning of the symbol of a!=b .....
a) a is not equal to b b) a is greater than b
c) a is less than b d) a is equal to b

Group B

Attempt any Six questions. [6×5 = 30]

2. How the availability of computers has in all probability changed the world forever? Give the reason.
3. What is multiprogramming?
4. Make a list of software products that you use?
5. How many ways can you think of to make the data in a computer secure?
6. What are the benefits of replacing people with computers in the office?
7. What CALL is. Explain it.
8. What is a greyscale display?

Group C

Attempt any Two questions. [2×10=20]

8. Imagine that you are applying for the post of a computer operator in a language teaching institute. Write a short a job application letter to the Managing Director of the institute presenting yourself as an eligible candidate.
9. Develop a readable advertisement of a product for **Computer Security or an Anti-Virus package** including its features and benefits.

OR Write an essay on Computers in Education in about 250 Words.

11. Write the summary of online services

MODEL SET 4

Group A

Attempt all the questions. [10×1 = 10]

1. **Circle (O) the correct answer.**

i. What is the similar meaning of buy.....
a) Worldwide b) purchase c) initial d) funded

ii. I could tell from all the..... on the board that a maths lesson was in progress.
a) compute b) computing c) computerize d) computations

iii. The word computerize has.....
a) an adverb-forming suffix b) noun-forming suffix
c) verb-forming suffix d) an adjective-forming suffix

iv. High-level language FORTRAN was introduced in.....
a) 1954 b) 1959 c) 1960 d) 1965

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v. The opposite meaning of rare is.....
a) alleviate b) pain c) safety d) plentiful

vi. The DBMS first receives the request and
a) analyse b) analysed c) analyst d) analyses

vii. A computer is define as
a) output devices b) an electronic device
c) does not include hardware d) a tiny piece of silicon

viii. Circle the word that is different.....
a) Virtual b) internal c) external d) conceptual

ix. The data was entered ....., so the result must be accurate
a) correction b) correct c) correctly d) correctness

x. What is the meaning of the symbol of a>b .....
a) a is not equal to b b) a is greater than b
c) a is less than b d) a is equal to b

Group B

Attempt any Six questions. **[6×5 = 30]**

2. Write short note on Mouse
3. List some of the task performed by an operating system.
4. What information does the code supply?
5. If you were a developer of software, what kind of software package would you develop? Why?
6. What is hacker?
7. Do you think it is possible that one day language teachers will be completely replaced by computers?
8. How are the multi-user data bases managed by a piece of software?

Group C

Attempt any two Questions: **(2×10=20)**

9. You are the Resources manage in a school. Write a memo to the heads of departments informing them that orders for text books and other required material for the next academic year should be submitted to you. Remind them that orders should be submitted on the standard forms and make clear the date for submission.

OR Imagine you are in charge of language teaching in an institute. Write a short report to the principal recommending the introduction of CALL.

10. As a purchasing officer, wonderful Company, New City, write to ideal Stationary Company, old city asking for the rates and terms of supply of pencils. Exercise books, paper and carbon paper.

OR Write the summary of computer networks.

11. Write two paragraphs; one listing the benefits the other listing the negative aspects of replacing people with computers.

MODEL SET 5

Group A

Attempt all the questions. **[10×1 = 10]**

1. Circle (O) the correct answer.

i. Most people prefer a colour screen to a .....chrome screen
   a) mini b) mega c) mono d) micro

ii. It was first introduced in Europe in 1960.
   a) C b) ALGOL c) PL/I d) APL

iii. The similar meaning of go beyond is.....
   a) cut through b) read c) overwhelm d) exceed

iv. already is.....
   a) Simultaneous with given time-reference adverbial
   b) Simultaneous with given time-reference Adjective
   c) before given time –reference Adjective
   d) before given time –reference adverbial

v. Today, many companies..... more on FAXes than on mail.
   a) Depend b) depending c) dependent d) dependence

vi. The similar meaning of approach is.....
   a) massive b) embraces c) plan d) expertise

vii. Circle the word that is different.....
   a) ring b) loop c) bus switched d) star

viii. The probe is..... to heat and light.
   a) Sensitive b) sensor c) sense d) sensation

ix. Retouch is defined as .....
   a) light-sensitive substance on the surface of film
   b) Succeed in representing on film
   c) Alter by making minor changes
   d) Device that uses compressed air to spray paint

x. What is the meaning of the symbol of a<b .....
   a) a is not equal to b b) a is greater than b
   c) a is less than b d) a is equal to b

Group B

Attempt any Six questions. **[6×5 = 30]**

2. What are the examples of batch-processing?
3. What are the advantages of digital transmission?
4. Write short note on programs and programming language.
5. What is distributed system?
6. What technique does the advertisement use to persuade people to buy the product?
7. What are the negative aspects of replacing human with computers?
8. Do you think multimedia systems will ever become as popular as conventional audio-visual system?

Group C

Attempt any Two questions. (2×10=20)

9. Write the summary of the text 24-bit colour BUZZ.

OR Assuming yourself to be the principal of the college. Write a memo informing the staff and students to switch off fans and lights when not in sue giving a reasons.

10. Write a paragraph to show the difference between analog and digital transmission.

OR Write a letter to Nilofer Typewriter Pvt. Ltd. complaining about the damaged condition of the typewriter received from them.

11. What technique does the advertisement use to persuade people to buy the product.

MODEL SET 6

Group 'A'

Attempt all the questions [10 ×1=10]

1. Circle (O) the correct answer in the following questions:

i. Which of the followings is an example of the word that is used for contextual reference?
a) they b) since c) earlier d) quickly

ii. Which of the followings is not an example of Prefixes used to make word negative?
a) Non- b) dis- c) inter- d) un-

iii. . . . is a suffix having the meaning of state in the word "Performance"?
a) –ist b) –ism c) –ance d) –ship

iv. Which of the followings is not used in organizing information in a text?
a) Main idea b) Major details c) Minor details d) Statement

v. Which of the following set of words are used for non-equivalence constructions in making comparisons?
a) As…as/similar to b) more…than/less…than
c) the most/the least d) the er../the est

vi. Which of the following time relater is used for after given time-reference in the sentences?
a) Afterwards b) At present c) Already d) At that time

vii. ……is an example of a protective device in a computer.
a) Detonator b) Shield c) Infector d) Leighs

viii. Which of the following is not an example of marker that can be used to show the order in which things are to be said?
a) Last but not least b) Moreover
c) first and foremost d) At any cost

ix. Which of the following verb phrase is true regarding the passive of sentence " Microsoft…..by Bill Gates in 1960s".
a) Are found b) was founded
c) is developed d) has been introduced

x. Which of the following is not used in giving examples?
a) For instance b) Such as c) Including d) However

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Group B

Attempt any Six questions. [6×5 = 30]

2. How small do you think computers can usefully become?
3. What online services are available in your country?
4. What is computer virus and how does it works?
5. What do you think are CALL's main advantages and disadvantages as a way of learning foreign languages?
6. Write short note on Artificial Intelligence.
7. Can you think of any actual or potential applications of multimedia in industry?
8. What is a pixel?

Group C

Attempt any Two questions. (2×10=20)

9. Write the summary of the text "Computers in medicine".

OR Assume yourself as the GM of XYZ company. Write a memo to the regional manager of the branch company instructing him/her to submit the annual report of the company before the dead line.

10. Prepare your resume for applying for the post of Deputy Director at Birgunj Sugar Factory.

OR In what other ways are computer used at home or outside in work

11. Write an advertisement for a real or imaginary notebook computer. Your material should include its name and type its size price and capacity and the feature that make it superior to other models.

MODEL SET 7

Group 'A'

Attempt all the questions [10 x1=10]

1. Circle (O) the correct answer in the following questions.

i. mainframe is .....
   a) Visual symbol used in a menu instead of natural language
   b) A device moved by hand to indicate position on the screen.
   c) A big computer system used for large- scale operations
   d) data, programs. etc., not forming part of a computer, but used when operating it

ii. Many..... students go on to work as engineers.
   a) Electronic b) Electronics c) Electronically d) electron

iii. The..... of these mathematical operations were obtained from the university mainframe and not from my micro.
   a) results b) resulting c) result d) to result

iv. What is the similar meaning of place.....
   a) blurred b) price c) global d) locality

v. What is the opposite meaning of frequently.....
   a) rarely b) aware c) installed d) enlarge

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vi. We have interviewed live ..... for the new position.
a) apply b) applicable c) applicants d) applying

vii. The procedure for .....a new file is very simple.
a) create b) creating c) creation d) created

viii. Which word is different from others.....
a) cyborg b) automaton c) android d) sentry

ix. She tried to escape..... by disguising herself.
a) detective b) detectable c) detect d) detection

x. Which is the protective meaning.....
a) infector b) password c) hacker d) word

Group B

Attempt any Six questions. [6×5 = 30]

2. Write short note on Magnetic card reader
3. Why is it important to assess the operating system in a computer before buying it?
4. What kind of facilities do online services provide?
5. Give some specific names of clipboard computers now available in the market and then explain the two different jobs of 'infector' and 'detonator'.
6. What is DBMS and what is its function?
7. What is a bit?
8. Discuss some of the applications of AI programs.

Group C

Attempt any Two questions. [2×10=20]

9. If you were a developer of software. What kind of software package would you develop? Why?

OR As the Chief of English Instructions committee, write a memo to all the teachers of your committee informing them that they should conduct their internal assessment within a week.

10. You are interested in upgrading your PC to use multimedia. Describe your machine to the salesperson and ask about the various options available. prices, etc.

OR Write a letter to Nilofer Typewriter Pvt. Ltd. Complaining about the damaged condition of the typewriter received from them.

11. Do you think the use of virtual reality in computer war games is going to affect young people's attitude to violence.

MODEL SET 8

Group A

Attempt all the questions. [10×1 = 10]

1. Circle (O) the correct answer.

i) Sooner is an example of .....
a) absolute adverb b) comparative adverbs
c) absolute adjective d) superlative adjective

ii) What is the synonym of inventive.....
a) deduce b) take part in c) depressed d) creative

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iii) Binary is the.....
a) prefixes of numbers b) prefixes of location
c) prefixes of size d) prefixes of time and order

iv) The DBMS first receives the request and
a) analyse b) analysed c) analyst d) analyses

v) Most people prefer a colour screen to a .....chrome screen
a) mini b) mega c) mono d) micro

vi) Which of the following time relater is used for after given time-reference in the sentences?
a) Afterwards b) At present c) Already d) At that time

vii) We have interviewed live ..... for the new position.
a) apply b) applicable c) applicants d) applying

viii) The similar meaning of changing is...
a) shifting b) overwhelming c) purchasing d) feed backing

ix) She tried to escape..... by disguising herself.
a) detect b) detectable c) detective d) detection

xi) What is the similar meaning of buy.....
a) Worldwide b) purchase c) initial d) funded

Group B

Attempt any Six questions. [6×5 = 30]

2. Write a paragraph to show the difference between analog and digital transmission.
3. What are the limitations of portable computers?
4. What is distributed system?
5. What is computer virus and how does it works?
6. Do you think it is possible that one day language teachers will be completely replaced by computers?
7. Make a list of jobs suitable for robots, and those to be done only by humans.
8. Can you think of any actual or potential applications of multimedia in industry?

Group 'C'

Attempt any Two questions. (2×10=20)

9. Your received your hundred bags of cement at your request of the order. But, later on, you found lack of proper weight in some of the bags. Write a complaint letter.

OR Do you think software developers should develop educational software more like the software developed for games? Why?

10. On behalf of the exam chief, write a memo informing all the faculties to submit the questions of their respective subjects for the UT I within the deadline provided already.

OR Design an advertisement for a PC protection package. Your advertisement should mention all the features listed below but you may add others. Choose a name, and decide on the best way to present your product.

Features

Passwords protection-system manager controls what each user is permitted to do

File encryption-plain test messages are converted into cipher (code) so that only authorized recipients can read them

Keyboard lock-screen is cleared and keyboard is locked after pre-set period of inactivity.

11. Write an essay on computer in education.

❑❑❑

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Mathematics I

New Syllabus

Bachelor in Computer Applications
Course Title: Mathematics I
Code No: CAMT 104
Semester: First

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Course Description

This course includes several topics from algebra and analytical geometry such as set theory and real and complex number; relation, functions and graphs; sequence and series; matrices and determinants; permutation & combination; conic section and vector in space which are essential as mathematical foundation for computing.

Course Objectives

The general objective of this course is to provide the students with basic mathematical skills required to understand Computer Application Courses.

Course Contents

Unit 1: Set Theory and Real & Complex Number **7 hrs.**

Concept, Notation and Specification of Sets, Types of Sets, Operations on Sets (Union, Intersection, Difference, Complement) and their Venn diagrams, Laws of Algebra of Sets (without proof), Cardinal Number of Set and Problems Related to Sets, Real Number System, Intervals, Absolute Value of Real Number, Introduction of Complex Number, Geometrical Representation of Complex Number, Simple Algebraic Properties of Complex Numbers (Addition, Multiplication, Inverse, Absolute Value)

Unit 2: Relation, Functions and Graphs **8 hrs.**

Ordered Pairs, Cartesian product, Relation, Domain and Range of a relation, Inverse of a relation; Types of relations; reflective, symmetric, transitive, and equivalence relations, Definition of function, Domain and Range of a function, Inverse function, Special functions (Identity, Constant), Algebraic (Linear, Quadratic, Cubic), Trigonometric and their graphs, Definition of exponential and logarithmic functions, Composite function. (Mathematica)

Unit 3: Sequence and Series **7 hrs.**

Sequence and Series (Arithmetic, Geometric, Harmonic), Properties of Arithmetic, Geometric, Harmonic sequences, A.M., G.M., and H.M. and relation among them. Sum of Infinite Geometric Series. Taylor's Theorem (without proof), Taylor's series, Exponential Series.

Unit 4: Matrices and Determinants **8 hrs.**

Introductions of Matrices, Types of Matrices, Equality of Matrices, Algebra of Matrices, Determinant, Transpose, Minors and Cofactors of Matrix. Properties of determinants (with out proof), Singular and non-singular matrix, adjoin and inverse of matrices, Linear transformations, orthogonal transformations; rank of matrices. (Matlab)

Unit 5: Analytical Geometry **8 hrs.**

Conic Sections: Definitions (Circle, Parabola, Ellipse, Hyperbola and Related Terms), Examples to Explain The Defined Terms, Equations and Graphs of the Conic Sections Defined Above, Classifying The Demand Conic Sections by Eccentricity and Related Problems, Polar Equations of Lines, Circles, Ellipse, Parabolas, and Hyperbolas. (Mathematica/Matlab)

Vectors in Space: Vectors in Space, Algebra of Vectors in Space, Length, Distance Between Two Points, Unit Vector, Null Vector. Scalar Product, Cross Product of

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Two and Three Vectors and Their Geometrical Interpretations and Related Examples. (Matlab).

Unit 6: Permutation and Combination **7 hrs.**

Basic Principle of Counting, Permutation of a. Set of Objects All Different b. Set of Objects Not All Different c. Circular Arrangement d. Repeated Use of the Same Object. Combination of Things All Different, Properties of Combination.

Laboratory Works

Mathematica and/or Matlab should ube used for above mentioned topics.

Teaching Methods

The general teaching pedagogy includes class lectures, group works, case studies, guest lectures, research work, project work, assignments (theoretical and practical), tutorials and examinations (written and verbal). The teaching faculty will determine the choice of teaching pedagogy as per the need of the topics.

Evaluation

Examination Scheme				Total
Internal Assessment		External Assessment		
Theory	Practical	Theory	Practical	
20	20 (3 hrs.)	60 (3 hrs.)	–	100

Text Book

1. Thomas, G.B., FInney, R.S., "Calculus with Analytic Geometry", Addison-Wesley, 9th Edition.

Reference Books

1. Bajracharya, D.R., Shrestha, R.M. & et. al., "Basic Mathematics I, II' Sukunda Pustak Bhawan, Nepal.
2. Budnick, F.S., "Applied Mathematics for Business, Economics and the Social Sciences", McGraw-Hill Ryerson Limited.
3. Monga, G.S., "Mathematics for Management and Economics", Vikas Publishing House Pvt. Ltd., New Delhi.
4. Paudel, K.C., GC. F.B., and et. al. "Higher Secondary Mathematics", Asmita Publication & Distributors Pvt. Ltd. Nepal.
5. Upadhayay, H. P., Pudel, K.C. & ct al., "Elements of Business Mathematics", Pinnacle Publication.
6. Yamane, T. "Mathematics for Economist", Prentice-hall of India.

TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

MODEL QUESTIONS-ANSWERS

Bachelor in Computer Applications
Course Title: Mathematics I
Code No: CAMT 104
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Group A

Attempt all the questions: **[10×1 = 10]**

1. Circle (O) the correct answer.

i) If n(U) = 350, n(A) = 240 and n(B) = 160, then the minimum value of $n(A \cap B)$ is

(a) 20 (b) 30 (c) 40 (d) 50

ii) If z = 2 – 3i then the multiplicative inverse of z is

(a) $\frac{1}{2+3i}$ (b) 2 + 3i (c) $\frac{2}{13}+\frac{3}{13}i$ (d) $\frac{2}{3}-\frac{3}{13}i$

iii) The value of ln(1 + 2 + 3) is equal to

(a) ln(1) × ln(2) × ln(3) (b) 0
(c) ln(1) + ln(2) + ln(3) (d) none of these

iv) The range of $y = x^2 + 1$ is

(a) $(1, \infty)$ (b) $[1, \infty)$ (c) $(-\infty, 1]$ (d) $(-\infty, 1]$

v) If p, q, r are in HP then $\frac{q+p}{q-p}+\frac{q+r}{q-r}$ is

(a) 2 (b) 3 (c) 4 (d) 5

vi. If A and B are any 2×2 matrices then |A + B| = 0 implies

(a) |A| + |B| = 0 (b) |A| = 0 or |B| = 0
(c) |A| = 0 and |B| = 0 (d) None of these

vii. Let $A = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ and define a transformation $T: R^2 \to R^2$ by T(x) = Ax then the image of $u = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$ under T is

(a) $\begin{bmatrix} 1 \\ 6 \end{bmatrix}$ (b) $\begin{bmatrix} 2 \\ 6 \end{bmatrix}$ (c) $\begin{bmatrix} 1 \\ 3 \end{bmatrix}$ (d) $\begin{bmatrix} 2 \\ 3 \end{bmatrix}$

viii. If $u = 3\vec{i} + \vec{j} + \vec{k}$ and $a = 4\vec{j} - 3\vec{k}$, find the projection of u in the direction of a.

(a) $-\frac{1}{25}\left(4\vec{j} - 3\vec{k}\right)$ (b) $\frac{7}{25}\left(4\vec{j} - 3\vec{k}\right)$

(c) $\frac{1}{25}\left(4\vec{j} - 3\vec{k}\right)$ (d) $-\frac{3}{25}\left(4\vec{j} - 3\vec{k}\right)$

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ix. Out of 6 books, in how many ways can a set of one or more books can be chosen?

(a) 60 (b) 61 (c) 62 (d) 63

x. The number of different four digit number that can be formed with the digit 2, 3, 4, 5, 6.

(a) 5! (b) $2 \times 4!$ (c) 6! (d) $3 \times 6!$

Answers Key

i. (d)	ii. (c)	iii. (c)	iv. (b)	v. (b)	vi.(c)	vii.(b)	viii. (c)	ix. (d)	x.(a)

i. Hint:

$$n(A \cap B) = n(A) + n(B) - n(U) = 240 + 160 - 350 = 50.$$

ii. Hint: Multiplicative inverse of z is $\frac{1}{z}$.

$$\frac{1}{z} = \frac{1}{2-3i} = \frac{2+3i}{(2)^2-(3i)^2} = \frac{2+3i}{4+9} = \frac{2+3i}{13} = \frac{2}{13} + \frac{3}{13}i.$$

iii. Hint:

$$\ln(1+2+3) = \ln(1) + \ln(2) + \ln(3).$$

iv. Hint:

Here, $y = x^2 + 1$. Clearly $x^2 \geq 0$. So

range $(y) = [0, \infty) + 1 = [1, \infty)$.

v. Hint:

Let p, q, r are in H.P. So, $q = \frac{2pr}{p+r}$

$$\text{Here, } \frac{q+p}{q-p} + \frac{q+r}{q-r} = \frac{q^2 - qr + pq - pr + q^2 + qr - pq - pr}{(q-p)(q-r)}$$

$$= \frac{2(q^2 - pr)}{(q-p)(q-r)}$$

$$= \frac{2\left[\left(\frac{4p^2r^2}{(p+r)^2}\right) - pr\right]}{\left(\frac{2pr}{p+r} - p\right)\left(\frac{2pr}{p+r} - r\right)}$$

$$= \frac{2[4p^2r^2 - pr(p+r)^2]}{p[2r-(p+r)]\, r[2p-(p+r)]}$$

$$= \frac{2pr\,[4pr - p^2 - r^2 - 2pr]}{pr\,(r-p)(p-r)}$$

$$= \frac{-2(p-r)^2}{-(p-r)^2}$$

$$= 2$$

vi. Hint:

Let $\det(A+B) = 0 \Rightarrow \det(A) + \det(B) = 0$

So, $\det(A) = 0$ and $\det(B) = 0$

vii. Hint:

image of u under T is

$$T(u) = Au = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 3 \end{bmatrix} = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$$

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viii. Hint:

Projection of $\vec{u}$ in the direction of $\vec{a}$ is,

$$\text{Proj}_{\vec{a}}(\vec{u}) = \left(\frac{\vec{u}\cdot\vec{a}}{|\vec{a}|^2}\right)\vec{a}$$

$$= \left(\frac{(3, 1, 1)\cdot(0, 4, -3)}{0^2 + 4^2 + (-3)^2}\right)\vec{a}$$

$$= \left(\frac{0 + 4 - 3}{16 + 9}\right)\vec{a}$$

$$= \left(\frac{1}{25}\right)(4\vec{j} - 3\vec{k}).$$

ix. Hint:

1st book can be chosen in $\frac{6!}{(6-5)!\,1!} = 6$ ways

2nd book can be chosen in $\frac{6!}{(6-2)!\,2!} = \frac{6\times5}{2\times1} = 15$ ways

3rd book can be chosen in $\frac{6!}{(6-3)!\,3!} = \frac{6\times5\times4}{3\times2\times7} = 20$ ways

4th book can be chosen in $\frac{6!}{(6-4)!\,4!} = \frac{6\times5}{2\times1} = 15$ ways

5th book can be chosen in $\frac{6!}{(6-5)!\,1!} = 6$ ways

6th book can be chosen in 1 ways

Therefore total number of way of selection is,

$6 + 15 + 20 + 15 + 6 + 1 = 63$ ways.

Group B

Attempt any SIX questions: **[6×5 = 30]**

2. If n(U) = 150, n(A) = 100, n(B) = 65, n(A∪B) = 110, find n(A∩B), n(A – B), n(B – A) and n(A∪B)'. Also, if B⊂A, find n(A∪B) and n(A∩B).

Sol^n: Let,

$$n(U) = 150,\ n(A) = 100,\ n(B) = 65,\ n(A\cup B) = 110.$$

Since, we have

$$n(A\cup B) = n(A) + n(B) - n(A\cap B)$$
$$\Rightarrow\quad 110 = 100 + 65 - n(A\cap B)$$
$$\Rightarrow\quad n(A\cap B) = 55.$$

Also, we have

$$n(A - B) = n(A) - n(A\cap B) = 100 - 55 = 45.$$

Also, we have

$$n(B - A) = n(B) - n(A\cap B) = 65 - 55 = 10.$$

Also, we have

$$n(A\cup B)' = n(U) - n(A\cup B) = 150 - 110 = 40.$$

Next, let $B \subset A$. Then

$$n(A\cup B) = n(A) = 100$$

and $$n(A\cap B) = n(B) = 65.$$

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3. If f, g: R→R be defined by f(x) = x^3 + 2 and g(x) = 4x − 1, find (fog)(x) and (gof)(x).

Sol^n: Let f : R→R, g: R→R are defined by $f(x) = x^3 + 2$ and $g(x) = 4x - 1$.
Here,

$$(fog)(x) = f(g(x)) = f(4x - 1) = (4x - 1)^3 + 2$$

and

$$(gof)(x) = g(f(x)) = g(x^3 + 2) = 4(x^3 + 2) - 1 = 4x^3 - 7.$$

4. How many terms of the series 2 + 6 + 18 + ... must be taken to make the sum equal to 728?

Sol^n: Given series is,

$$2 + 6 + 18 + \ldots$$

i.e. $2(1 + 3 + 3^2 + \ldots)$ ... (i)

Here $1 + 3 + 3^2 + \ldots$ is a geometric series with common ratio 3.
Also, given that the sum of finite terms of series (i), is 728. Therefore,

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

i.e. $728 = \frac{2(1 - 3^n)}{1 - 3}$

$\Rightarrow$ $728 = 3^n - 1$

$\Rightarrow$ $729 = 3^n$

$\Rightarrow$ $n = 6$.

This means the sum of first 6 terms of (i) is 728.

5. Find the adjoint of the matrx: $\begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$.

Sol^n: Given matrix is

$$A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}.$$

Here,

cofactor of 1 (i.e. a_{11}) $= (-1)^{1+1} \begin{vmatrix} 3 & 0 \\ -2 & 1 \end{vmatrix} = 3$

cofactor of 2 (i.e. a_{12}) $= (-1)^{1+2} \begin{vmatrix} -1 & 0 \\ 0 & 1 \end{vmatrix} = 1$

cofactor of −2 (i.e. a_{13}) $= (-1)^{1+3} \begin{vmatrix} -1 & 3 \\ 0 & -2 \end{vmatrix} = 2$

cofactor of −1 (i.e. a_{21}) $= (-1)^{2+1} \begin{vmatrix} 2 & -2 \\ -2 & 1 \end{vmatrix} = 2$

cofactor of 3 (i.e. a_{22}) $= (-1)^{2+2} \begin{vmatrix} 1 & -2 \\ 0 & 1 \end{vmatrix} = 1$

cofactor of 0 (i.e. a_{23}) $= (-1)^{2+3} \begin{vmatrix} 1 & 2 \\ 0 & -2 \end{vmatrix} = 2$

cofactor of 0 (i.e. a_{31}) $= (-1)^{3+1} \begin{vmatrix} 2 & -2 \\ 3 & 0 \end{vmatrix} = -6$

$$\text{cofactor of } -2 \text{ (i.e. } a_{32}) = (-1)^{3+2}\begin{vmatrix} 1 & 2 \\ -1 & 0 \end{vmatrix} = -2$$

$$\text{cofactor of } 1 \text{ (i.e. } a_{33}) = (-1)^{3+3}\begin{vmatrix} 1 & 2 \\ -1 & 3 \end{vmatrix} = 5$$

Now, the adjoint matrix of A is Adj (A) is,

$$\text{Adj (A)} = \text{Transpose of cofactor matrix of A}$$

$$= \begin{bmatrix} 3 & 1 & 2 \\ 2 & 1 & 2 \\ -6 & -2 & 5 \end{bmatrix}^T$$

$$= \begin{bmatrix} 3 & 2 & -6 \\ 1 & 1 & -2 \\ 2 & 2 & 5 \end{bmatrix}.$$

6. **Show that the matrix is orthogonal:** $A = \begin{bmatrix} 2/3 & -2/3 & 1/3 \\ 1/3 & 2/3 & 2/3 \\ 2/3 & 1/3 & -2/3 \end{bmatrix}$.

Sol^n: Given matrix is,

$$A = \begin{bmatrix} 2/3 & -2/3 & 1/3 \\ 1/3 & 2/3 & 2/3 \\ 2/3 & 1/3 & -2/3 \end{bmatrix} = \left(\frac{1}{3}\right)\begin{bmatrix} 2 & -2 & 1 \\ 1 & 2 & 2 \\ 2 & 1 & -2 \end{bmatrix}$$

Then,

$$A^T = \begin{bmatrix} 2/3 & -1/3 & 2/3 \\ -2/3 & 2/3 & 1/3 \\ 1/3 & 2/3 & -2/3 \end{bmatrix} = \left(\frac{1}{3}\right)\begin{bmatrix} 2 & 1 & 2 \\ -2 & 2 & 1 \\ 1 & 2 & -2 \end{bmatrix}$$

Here,

$$AA^T = \left(\frac{1}{3}\right)\begin{bmatrix} 2 & -2 & 1 \\ 1 & 2 & 2 \\ 2 & 1 & -2 \end{bmatrix}\left(\frac{1}{3}\right)\begin{bmatrix} 2 & 1 & 2 \\ -2 & 2 & 1 \\ 1 & 2 & -2 \end{bmatrix}$$

$$= \left(\frac{1}{9}\right)\begin{bmatrix} 4+4+1 & 2-4+2 & 4-2-2 \\ 2-4+2 & 1+4+4 & 2+2-4 \\ 4-2-2 & 2+2-4 & 4+1+4 \end{bmatrix}$$

$$= \left(\frac{1}{9}\right)\begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I.$$

And

$$A^TA = \left(\frac{1}{3}\right)\begin{bmatrix} 2 & 1 & 2 \\ -2 & 2 & 1 \\ 1 & 2 & -2 \end{bmatrix}\left(\frac{1}{3}\right)\begin{bmatrix} 2 & -2 & 1 \\ 1 & 2 & 2 \\ 2 & 1 & -2 \end{bmatrix}$$

$$= \left(\frac{1}{9}\right)\begin{bmatrix} 4+1+4 & -4+2+2 & 2+2-4 \\ -4+2+2 & 4+4+1 & -2+4-2 \\ 2+2-4 & -2+4-2 & 1+4+4 \end{bmatrix}$$

$$= \left(\frac{1}{9}\right)\begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I.$$

Thus, $AA^T = A^TA = I$. This means A is orthogonal.

7. Identify the conic $r = \frac{6}{3 + 2\sin\theta}$ with focus at the origin, the directrix, and the eccentricity.

Sol^n: Given conic is

$$r = \frac{6}{3 + 2\sin\theta} = \frac{2}{1 + (2/3)\sin\theta} \quad \ldots \text{(i)}$$

Comparing (i) with $r = \frac{ed}{1 + e\sin\theta}$ then

$$e = \frac{2}{3} \quad \text{and} \quad ed = 2 \Rightarrow d = \frac{2}{e} = 3.$$

Here, $e = \frac{2}{3} < 1$. So, the conic is ellipse.

Also, the eccentricity $(e) = \frac{2}{3}$ and the equation of directrix is

$$y = d \quad \text{i.e.} \quad y = 3.$$

8. If $^nC_r = 78$ and $^nP_r = 156$, find n and r.

Sol^n: Given that,

$$^nC_r = 78 \quad \text{and} \quad ^nP_r = 156.$$

$$\text{i.e.} \quad \frac{n!}{(n-r)!\,r!} = 78 \quad \text{and} \quad \frac{n!}{(n-r)!} = 156.$$

This implies

$$156 = 78\,(r!)$$
$$\Rightarrow \quad r! = 2$$
$$\Rightarrow \quad r = 2.$$

Therefore,

$$\frac{n!}{(n-2)!} = 156$$
$$\Rightarrow \quad \frac{n(n-1)\,(n-2)!}{(n-2)!} = 156$$
$$\Rightarrow \quad n(n-1) = 156$$
$$\Rightarrow \quad n^2 - n - 156 = 0$$
$$\Rightarrow \quad n^2 - 13n + 12n - 156 = 0$$
$$\Rightarrow \quad (n-13)\,(n+12) = 0$$
$$\Rightarrow \quad n = 13$$

being negative value is not acceptable on permutation.

Thus, $n = 13$, $r = 2$.

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Group 'C'

Attempt any TWO questions. **[2×10=20]**

9. Define domain and range of a function f(x). A function f is defined on the set of integers as follows:

$$f(x) = \begin{cases} 1 + x & \text{for } 1 \le x < 2 \\ 2x - 1 & \text{for } 2 \le x < 4 \\ 3x - 10 & \text{for } 4 \le x < 6 \end{cases}$$

Find the domain and range of f.

Sol^n: Definition of Domain and Range of f(x):

let f(x) is a function. Then the set of all possible values of x such that f(x) is defined, is called the domain of f(x). And the set of all possible values of f(x) which is given by f(x) for those x which is in domain set, is called the range of f(x).

Problem part:

Let,

$$f(x) = \begin{cases} 1 + x & \text{for } 1 \le x < 2 \\ 2x - 1 & \text{for } 2 \le x < 4 \\ 3x - 10 & \text{for } 4 \le x < 6 \end{cases}$$

Here $(1 + x)$, $(2x - 1)$, $(3x - 10)$ all are polynomial forms.

So, f(x) is defined for $x \in [1, 2) \cup [2, 4) \cup [4, 6)$. i.e. for $x \in [1, 6)$.

Therefore, the domain of f(x) is

$$\text{dom}(f) = [1, 6).$$

Next, for $x \in [1, 2)$, we observe f(x) has value on $1 + [1, 2) = [2, 3)$

and for $x \in [2, 4)$, we observe f(x) has value on

$$2[2, 4) - 1 = [4, 6) - 1 = [3, 5)$$

and for $x \in [4, 6)$ we observe f(x) has value on

$$3[4, 6) - 10 = [12, 18) - 10 = [2, 8).$$

Therefore, the range of f(x) is

$$\text{Ran}(f) = [2, 3) \cup [3, 5) \cup [2, 8) = [2, 8).$$

10. The A.M., G.M. and H.M. between any two unequal positive numbers satisfy the following relations:

(a) $(G.M.)^2 = A.M. \times H.M.$ (b) $A.M. > G.M. > H.M.$

Sol^n: Let a and b are two unequal positive numbers.

Then

$$A.M. = \frac{a+b}{2},\ G.M. = \sqrt{ab},\ H.M. = \frac{2ab}{a+b}$$

(a) Here,

$$A.M. \times H.M. = \left(\frac{a+b}{2}\right) \times \left(\frac{2ab}{a+b}\right) = ab = (G.M.)^2$$

(b) Here,

$$\begin{aligned} A.M. - G.M. &= \left(\frac{a+b}{2}\right) - \sqrt{ab} \\ &= \frac{a + b - 2\sqrt{ab}}{2} \\ &= \frac{(\sqrt{a} - \sqrt{b})^2}{2} \quad \text{(being a, b both are positive]} \\ &> 0 \end{aligned}$$

$$\Rightarrow \quad A.M. > G.M. \quad \ldots (i)$$

and

$$G.M. - H.M. = \sqrt{ab} - \frac{2ab}{a+b}$$

$$= \frac{(a+b)\sqrt{ab} - 2ab}{a+b}$$

$$= \left(\frac{\sqrt{ab}}{a+b}\right)(a+b-2\sqrt{ab})$$

$$= \left(\frac{\sqrt{ab}}{a+b}\right)(\sqrt{a}-\sqrt{b})^2$$

$$> 0 \quad \text{being both a, b are positive.}$$

$$\Rightarrow \quad G.M. > H.M. \quad \ldots (ii)$$

From (i) and (ii),

$$A.M. > G.M. > H.M.$$

11. a. In how many ways can the letters of the word 'ARRANGE' be arranged so that no two R and no two A come together. [4]

Sol^n: Given word is 'ARRANGE'.

There are 7 letters in the word in which 'R' and 'A' are repeated twice.

Therefore total number of arrangements of the letters $= \frac{7!}{2!\,2!} = 1260$.

If two R come together then consider these two 'R' as a single letter then the arrangements will be

$$\frac{6!}{2!\,1!} = 360.$$

Similarly, if two 'A' comes together then the arrangement will be 360.

Thus, the total number of arrangements so that no two 'R' and no two 'A' come together is

$$1260 - 360 - 360$$
$$= 540.$$

11. b. If $^nC_r = 78$ and $^nP_r = 156$, find n and r. [6]

Sol^n: Here,

$$^nC_r = 78$$

$$\text{i.e.} \quad \frac{^nP_r}{r!} = 78 \quad \ldots (i) \qquad \left[\text{Since } ^nC_r = \frac{^nP_r}{r!}\right]$$

$$\text{and } ^nP_r = 156 \quad \ldots (ii)$$

Using (ii) and (i) we get,

$$\frac{156}{r!} = 78$$

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$\Rightarrow \quad r! = \frac{156}{78} = 2$

i.e. $\quad r! = 2!$ [since $2 = 2!$]

$\Rightarrow \quad r = 2$

Then (ii) becomes,

$$\frac{n!}{(n-r)!} = 156$$

$\Rightarrow \quad \frac{n!}{(n-2)!} = 156$ [Since $r = 2$]

$\Rightarrow \quad \frac{n(n-1)(n-2)!}{(n-2)!} = 156$

$\Rightarrow \quad n(n-1) = 156$

$\Rightarrow \quad n^2 - n - 156 = 0$

$\Rightarrow \quad (n-13)(n+12) = 0$

Either $\quad n - 13 = 0 \Rightarrow n = 13$

or $\quad n + 12 = 0 \Rightarrow n = -12$ (Which is not possible being negative)

Thus, $n = 13$ and $r = 2$.

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TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

TU QUESTIONS-ANSWERS 2018

Bachelor in Computer Applications
Course Title: Mathematics I
Code No: CAMT 104
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Group B

Attempt any **SIX** questions: [6×5 = 30]

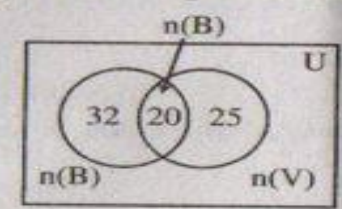
2. 32 students play basketball and 25 students play volleyball. It is found that 20 students play both the games. Find the number of students playing at least one game. Also, find total number of students if 13 students play none of these games.

Sol^n: Given that

32 students play basketball i.e. $n(B) = 32$
25 students play volley ball i.e. $n(V) = 25$
20 students play ball games i.e. $n(B \cap V) = 20$

Then we have to find the number of students who play at least one game. That is, $n(B \cup V) = ?$

Here,



$$n(B \cup V) = n(B) + n(V) - n(B \cap V)$$
$$= 32 + 25 - 20$$
$$= 37.$$

Also, given that

13 students play none of these games i.e. $n(none) = 13$.

Now, the total number of students $n(\cup)$ is

$$n(U) = n(B) + n(V) - n(B \cap V) + n(none)$$
$$= n(B \cup V) + n(none)$$
$$= 37 + 13$$
$$= 50.$$

Thus, 37 students play both games and total numbers of students are 50.

3. Let f: N→N be defined by f(x) = 2x for all x∈N where N is the set of natural numbers. Show that f is one–one but not onto function.

Sol^n: Let $f: N \to N$ is defined by

$$f(x) = 2x \text{ for } x \in N.$$

Let $x_1, x_2 \in N$,

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$$f(x_2) = f(x_1) \quad \Rightarrow \quad 2x_2 = 2x_1$$
$$\Rightarrow \quad x_2 = x_1$$

This means f is one-to-one.

Next, we have, $3 \in N$ but there is no $x \in N$ such that $2x = 3$.

$$\Rightarrow x = \frac{3}{2}$$

This means f is not onto.

4. If the three consecutive term of a geometric series be increased by their middle term, then prove that the resulting terms will be in harmonic progression (H.S.).

Sol^n: Let a, b, c are three consecutive terms of G.S. with increased by middle term. So,

$$2b > (a + b) \qquad \ldots \text{(i)}$$

Since a, b, c are in G.S., so

$$b^2 > ac \qquad \ldots \text{(ii)}$$

Then we wish to show a, b, c are in H.P.

Suppose a, b, c are in H.P. so

$$b = \frac{2ac}{a+c} < \frac{2b^2}{a+c} \qquad [\because \text{using (ii)}]$$

$$\Rightarrow \quad 1 < \frac{2b}{a+c}$$

$$\Rightarrow \quad (a + b) < 2b$$

which is true by (i).

This means a, b, c are in H.P.

5. Find the adjoint of the matrix: $\begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$.

Sol^n: See BCA Model, Q. 5.

6. Prove that: $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = xyz\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z} + 1\right)$.

Sol^n: Here

$$\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix}$$

$$= \frac{xyz}{xyz}\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix}$$

Applying $C_1 \to \frac{C_1}{x}, C_2 \to \frac{C_2}{y}, C_3 \to \frac{C_3}{z}$ then

$$= xyz\begin{vmatrix} 1+\frac{1}{x} & \frac{1}{y} & \frac{1}{z} \\ \frac{1}{x} & 1+\frac{1}{y} & \frac{1}{z} \\ \frac{1}{x} & \frac{1}{y} & 1+\frac{1}{z} \end{vmatrix}$$

Applying $C_1 \to (C_1 + C_2 + C_3)$ and then taking out common factor $\left(1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$ we get

$$= xyz\left(1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)\begin{vmatrix} 1 & \frac{1}{y} & \frac{1}{z} \\ 1 & 1+\frac{1}{y} & \frac{1}{z} \\ 1 & \frac{1}{y} & 1+\frac{1}{z} \end{vmatrix}$$

Applying $R_2 \to R_2 - R_1$, $R_3 + R_3 - R_1$ then

$$= (xyz)\left(1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)\begin{vmatrix} 1 & 1/y & 1/z \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

$$= xyz\left(1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right).$$

7. Find the equation of parabola with focus (–1, 2) and directrix x = –5.

Sol^n: Given that the focus of the parabola is (–1, 2) and its equation of directrix is x = –5.

Here the directrix has x as its variable. So, the focus of the parabola is,

$$F(h + a, k)$$

Therefore,

$$F(h + a, k) = F(-1, 2)$$

So

$$h + a = -1, k = 2.$$

Since we know the distance between line of directrix and focus point is 2a. That is,

$$2a = |(-1) - (-5)| = 4$$

$$\Rightarrow \quad a = 2.$$

Then

$$h = -3$$

Thus, h = – 3, k = 2 and a = 2.

Since the parabola has focus with fixed y-value. So, the equation of the parabola is

$$(y - k)^2 = 4a\,(x - h)$$

i.e. $(y - 2)^2 = 8(x + 3)$.

8. Transform $u = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ and $v = \begin{bmatrix} -2 \\ 31 \end{bmatrix}$ by $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ and check whether this transformation is linear.

Sol^n: Let

$$u = \begin{bmatrix} 1 & -2 \\ -1 & 31 \end{bmatrix} \text{ and } A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

Here the transform of u and v by A are

$$Au = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

and

$$Av = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} -2 \\ 31 \end{bmatrix} = \begin{bmatrix} -31 \\ -2 \end{bmatrix}$$

Here

$$Au + Av = \begin{bmatrix} 1 \\ 1 \end{bmatrix} + \begin{bmatrix} -31 \\ -2 \end{bmatrix} = \begin{bmatrix} -30 \\ -1 \end{bmatrix}$$

And

$$A(u + v) = A\left(\begin{bmatrix} 1 \\ -1 \end{bmatrix} + \begin{bmatrix} -2 \\ 31 \end{bmatrix}\right)$$

$$= \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} -1 \\ 30 \end{bmatrix} = \begin{bmatrix} -30 \\ -1 \end{bmatrix} = Au + Av$$

Also, for a scalar α,

$$A(\alpha u) = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} \alpha \\ -\alpha \end{bmatrix} = \begin{bmatrix} \alpha \\ \alpha \end{bmatrix} = \alpha \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \alpha(Au)$$

This means the transformation is linear.

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. **Define permutation and combination. Try to establish relationship between them with the help of formulae. In how many ways can the letters of the word "LOGIC" be a arranged so that:**
(i) vowels may occupy odd position?
(ii) no vowels are together?

Sol^n: <u>Definition of Permutation and Combination:</u>

The arrangement of specified objects in specified order, is the permutation. The specified selection of object and manage the arrangement of these objects without ordering, is the combination. Normally, the permutation of n objects in which r are taken at the time, is denoted by ${}^nP_r$.

$${}^nP_r = \frac{n!}{(n-r)!}.$$

And the combination of n objects in which r are taken at the time, is denoted by ${}^nC_r$ and is defined as

$${}^nC_r = \frac{n!}{(n-r)!\,r!}.$$

<u>Relationship between Permutation and Combination:</u>

The permutation and combination of n objects taken r at a time is

$${}^nP_r = \frac{n!}{(n-r)!} \quad \text{and} \quad {}^nC_r = \frac{n!}{(n-r)!\,r!}.$$

Here

$${}^nC_r = \frac{n!}{(n-r)!\,r!} = \frac{{}^nP_r}{r!}$$

Problem Part:

Given word is 'LOGIC'.

Here, number of letters in the word is 5.

(i) Here, number of vowel in the word LOGIC, are 2. Since the vowels occupy only odd positions, so they have 3–positions and they are – first, third and fifth.

Here 2 vowels can be arranged in $^3P_2$ ways and the remaining 3 letters can be arranged in $^3P_3$ ways.

Therefore, the total numbers of arrangements are

$$= (^3P_2) \cdot (^3P_3)$$

$$= \left(\frac{3!}{(3-2)!}\right)\left(\frac{3!}{(3-3)!}\right) = (6)(6) = 36.$$

(ii) There are 5 letters in the words LOGIC with no repeated letter. So, the letters can be arranged in 5! ways i.e. 120 ways.

Clearly the word included two vowel letters. If these two vowels come together then assuming these two as one letter, we observe the word consists 4 letters which can be arranged in 4! ways = 24 ways.

Therefore, the total number of arrangement so that no vowels are together is

$$(120 - 24) \text{ ways}$$

$$= 96 \text{ ways.}$$

10. Define scalar and vector product in three dimensional space with their geometrical interpretation and prove the formula sin(A + B) = sinA cosB + cosA sinB by using vector method.

Sol^n: Definition of Scalar and Vector triple Product:

Let $\vec{a}$, $\vec{b}$, $\vec{c}$ are three vectors. Then the scalar triple product is defined as

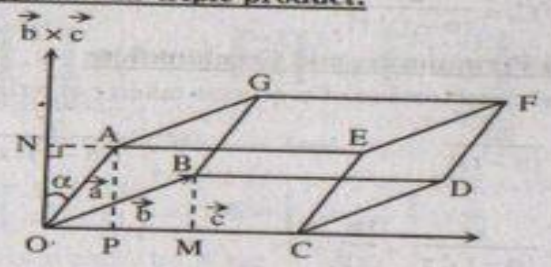
$$\vec{a} \cdot (\vec{b} \times \vec{c}) = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}.$$

where $\vec{a} = (a_1, a_2, a_3)$, $\vec{b} = (b_1, b_2, b_3)$, $\vec{c} = (c_1, c_2, c_3)$.

And the vector triple product is defined as

$$\vec{a} \cdot (\vec{b} \times \vec{c}) = (\vec{a} \cdot \vec{c})\,\vec{b} - (\vec{a} \cdot \vec{b})\,\vec{c}.$$

Geometrical meaning of scalar triple product:



Let $\overrightarrow{OA} = \vec{a}$, $\overrightarrow{OB} = \vec{b}$ and $\overrightarrow{OC} = \vec{c}$ are three co–initial vectors.

Draw OB‖CD, OC‖BD, OA‖CE, OC‖AE, OB‖AG, CD‖EF, BD‖GF then we observe a parallelopiped OAGFECDB. Clearly the base of the parallelopiped is OBDC which is a parallelogram.

Draw BM⊥OC. Then we obtain ΔOBM is a right angled triangle. Then in ΔOBM,

$$\sin\theta = \frac{BM}{OB} \text{ where } \theta \text{ be the angle between OB and OC.}$$

By definition of vector product of two vectors, $\overrightarrow{OB}$ and $\overrightarrow{OC}$,

$$\overrightarrow{OB} \times \overrightarrow{OC} = |\overrightarrow{OB}|\,|\overrightarrow{OC}| \sin\theta\, \hat{n}$$

where $\hat{n}$ be the unit vector along $\overrightarrow{OB} \times \overrightarrow{OC}$

i.e. $|\vec{b} \times \vec{c}| = |\vec{b}|\,|\vec{c}| \sin\theta\, |\hat{n}|$

$\Rightarrow \quad |\vec{b} \times \vec{c}| = bc\left(\frac{BM}{OB}\right) \qquad (\because |\hat{n}| = 1)$

$\Rightarrow \quad |\vec{b} \times \vec{c}| = c\,(BM) \qquad (\because OB = b)$

$= (\text{base of OBDC})\,(\text{height of OBDC})$

$= \text{area of OBDC} \qquad \ldots (i)$

Again draw AN ⊥ $(\vec{b} \times \vec{c})$. Then we observe a right angled triangle ΔOAN. Let α be the angle between $(\vec{b} \times \vec{c})$ and $\vec{a}$. Then in ΔOAN,

$$\cos\alpha = \frac{ON}{OA} = \frac{ON}{|\vec{a}|}$$

Construct AP⊥OC. Then ON = AP. Therefore,

$$\cos\alpha = \frac{AP}{|\vec{a}|}$$

Clearly AP is the height of the parallelopiped.

Now, by definition of scalar product of two vectors $\vec{a}$ and $(\vec{b} \times \vec{c})$,

$$\vec{a} \cdot (\vec{b} \times \vec{c}) = |\vec{a}|\,|\vec{b} \times \vec{c}| \cos\theta$$

$$= |\vec{b}|\,(\text{area of OBDC})\frac{AP}{|\vec{a}|} \qquad [\text{using (i)}]$$

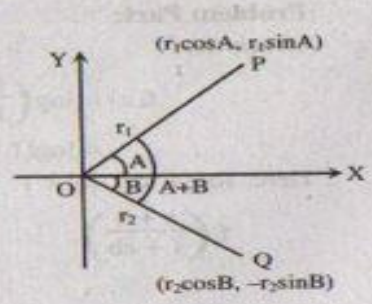
$= (\text{area of OBDC})\,(AP)$

$= (\text{area of OBDC})\,(\text{height of the parallelopiped})$

$= \text{volume of the parallelopiped.}$

Last Part:

Let $|\overrightarrow{OP}| = r_1$ and $|\overrightarrow{OQ}| = r_2$. Let OP makes an angle A with x–axis and OQ makes an angle B with x–axis. That is ∠POX = A and ∠QOX = B. Then angle between OP and OQ is A + B.



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Then we get the $\overrightarrow{OP} = r_1\cos A\ \vec{i} + r_1\ \sin A\ \vec{j} = (r_1\cos A,\ r_1\sin A)$ and $\overrightarrow{OQ} = r_2\cos B\ \vec{i} - r_2\ \sin B\ \vec{j} = (r_2\cos B, -r_2\sin B)$.

Now by using definition of dot product between two vectors

$$\overrightarrow{OP} \times \overrightarrow{OQ} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ r_1\cos A & r_1\sin A & 0 \\ r_2\cos B & -r_2\sin B & 0 \end{vmatrix}$$

$$= 0\vec{i} + 0\vec{j} + (-r_1r_2\cos A\sin B - r_1r_2\sin A\cos B)\ \vec{k}$$

$$= 0\vec{i} + 0\vec{j} + (-r_1r_2\,(\sin A\cos B + \cos A\sin B))\ \vec{k}$$

So,

$$|\overrightarrow{OP} \times \overrightarrow{OQ}| = \sqrt{0^2 + 0^2 + [-r_1r_2(\sin A\cos B + \cos A\sin B)]^2}$$

$$= r_1r_2\sin A\cos B + \cos A\sin B$$

Now using of vector product between two vectors $\overrightarrow{OP}$ and $\overrightarrow{OQ}$,

$$|\overrightarrow{OP} \times \overrightarrow{OQ}| = |\overrightarrow{OP}|\ |\overrightarrow{OQ}|\sin(A + B)$$

i.e. $r_1r_2\,(\sin A\cos B + \cos A\sin B) = r_1r_2\sin(A + B)$

$\Rightarrow$ $\sin(A + B) = \sin A\cos B + \cos A\sin B$

11. Define the logarithmic function, state its properties and if $f(x) = \log\left(\frac{1+x}{1-x}\right)$ $(-1 < x < 1)$, show that $f(a) + f(b) = f\left(\frac{a+b}{1+ab}\right)$ $(|a| < 1, |b < 1)$.

Sol^n: <u>Definition of Logarithm Function:</u>

If $y = f(x) = a^x$ (for $a > 0$) then x can be written as

$$x = \log_{(a)}(y)$$

which is known as logarithm function.

Some properties of logarithm function:

For $x > 0$, $y > 0$, $a > 0$, $b > 0$,

(i) $\log_a(xy) = \log_{(a)}(x) + \log_{(a)}(y)$

(ii) $\log_a\left(\frac{x}{y}\right) = \log_a(x) - \log_{(a)}(y)$

(iii) $\log_a(x^m) = (m)\,(\log_a(x))$

(iv) $\log_a(x) = (\log_b(x))\,(\log_a(b))$

(v) $\log_a(a) = 1$

(vi) $\log_a(1) = 0$.

Problem Part:

Given that

$$f(x) = \log\left(\frac{1+x}{1-x}\right) \quad (\text{for } -1 < x < 1).$$

$$= \log(1 + x) - \log(1 - x) \qquad \ldots (1)$$

Here, for $|a| < 1$, $|b| < 1$.

$$f\left(\frac{a+b}{1+ab}\right)$$

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$$= \log\left(1 + \frac{a+b}{1+ab}\right) - \log\left(1 - \frac{a+b}{1+ab}\right)$$

$$= \log\left(\frac{1+ab+a+b}{1+ab}\right) - \log\left(\frac{1+ab-a-b}{1+ab}\right)$$

$$= \log(1+ab+a+b) - \log(1+ab) - \log(1+ab-a-b) + \log(1+ab)$$

$$= \log(1+ab+a+b) - \log(1+ab-a-b)$$

$$= \log\left(\frac{1+ab+a+b}{1+ab-a-b}\right) \quad \ldots \text{(ii)}$$

And,

$$f(a) + f(b)$$

$$= \log(1+a) - \log(1-a) + \log(1+b) - \log(1-b)$$

$$= \log((1+a)(1+b)) - \log((1-a)(1-b))$$

$$= \log(1+ab+a+b) - \log(1+ab-a-b)$$

$$= \log\left(\frac{1+ab+a+b}{1+ab-a-b}\right) \quad \ldots \text{(iii)}$$

From (ii) and (iii),

$$f(a) + f(b) = f\left(\frac{a+b}{1+ab}\right).$$

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TU QUESTIONS-ANSWERS 2019

Bachelor in Computer Applications
Course Title: Mathematics I
Code No: CAMT 104
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Group B

Attempt any SIX questions: **[6×5 = 30]**

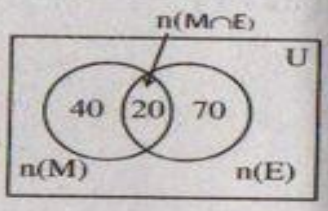
2. In class of 100 students 40 students failed in Mathematics, 70 failed in English and 20 failed in both subjects. Find

a. How many students passed in both subjects?

b. How many students passed in Mathematics only?

c. How many students failed in Mathematics only?

Sol^n: Given that



Total students i.e. $n(U) = 100$.

40 students failed in Mathematics.

i.e. $n(M) = 40$.

70 students failed in English

i.e. $n(E) = 70$.

20 students failed in both subjects

i.e. $n(M \cap E) = 20$.

a. Then we have to find the number of students who passed in both subjects. That is, $\overline{n(M \cup E)} = ?$

Here, number of student who failed in either subject is,

$$\begin{aligned} n(M \cup E) &= n(M) + n(E) - n(M \cap E) \\ &= 40 + 70 - 20 \\ &= 110 - 20 \\ &= 90 \end{aligned}$$

Then, $\overline{n(M \cup E)} = n(U) - n(M \cup E) = 100 - 90 = 10$.

Thus 10 students passed in both subjects.

b. Number of students passed in Mathematics is,

$n(\overline{M}) = n(U) - n(M) = 100 - 40 = 60$.

Therefore, number of students passed in Mathematics only is,

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$n_0(\overline{M}) = n(\overline{M}) - \overline{n(M \cup E)} = 60 - 10 = 50.$

Thus 50 students passed in Mathematics only.

c. Number of students failed in mathematical only is,

$$n_0(M) = n(M) - n(M \cap E) = 40 - 20 = 20.$$

Thus 20 students failed in Mathematics only.

3. Find the domain and range of the function $f(x) = \frac{2x+1}{3-x}$.

Sol^n: Given function is,

$$f(x) = \frac{2x-1}{x-3}$$

Clearly f(x) is polynomial function which is defined for $x - 3 \neq 0$ i.e. $x \neq 3$.

Therefore, the domain of f(x) is $R - \{3\}$.

For range,

$$y = f(x) = \frac{2x-1}{x-3}$$

$$\Rightarrow \quad xy - 3y = 2x - 1$$

$$\Rightarrow \quad x(y-2) = 3y - 1$$

$$\Rightarrow \quad x = \frac{3y-1}{y-2} \text{ which is defined for } y - 2 \neq 0 \text{ i.e. } y \neq 2.$$

So, the range of $f(x) = y$ is $R - \{2\}$.

4. Find the Maclaurin series of the function f(x) = sin x.

Sol^n: Let,

$$f(x) = \sin x$$

By Maclaurin's series we have,

$$f(x) = f(0) + xf'(0) + \frac{x^2}{2!}f''(0) + \frac{x^3}{3!}f'''(0) + \ldots \qquad \ldots \text{(i)}$$

Here, $f(x) = \sin x$

Differentiating we get,

$f(x) = \sin x$ $\qquad$ $f'(x) = \cos x$

$f''(x) = -\sin x,$ $\qquad$ $f'''(x) = -\cos x,$

$f^{iv}(x) = \sin x,$ $\qquad$ $f^{v}(x) = \cos x,$

$\vdots$ $\qquad$ $\vdots$

$f^{(2n)}(x) = (-1)^n \sin x$ $\qquad$ $f^{(2n+1)}(x) = (-1)^n \cos x$

and so on.

At $x = 0$,

$$f(x) = f''(x) = f^{iv}(x) = \ldots = f^{(2n)}(x) = \ldots = 0.$$

and, $f'(x) = 1, f'''(x) = -1, f^{v}(x) = 1, \ldots, f^{(2n+1)}(x) = (-1)^n$

and so on

Now, (i) becomes

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \ldots + (-1)^n \frac{x^{2n+1}}{(2n+1)!} + \ldots$$

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5. **Prove that** $\begin{bmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{bmatrix} = (x-y)(y-z)(z-x)$.

Sol^n: Here,

$$\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = \begin{vmatrix} 1 & x & x^2 \\ 0 & y-x & y^2-x^2 \\ 0 & z-x & z^2-x^2 \end{vmatrix} \quad \begin{bmatrix} \text{Applying} \\ \because R_2 \to (R_2 - R_1) \\ R_3 \to (R_3 - R_1) \end{bmatrix}$$

$$= \begin{vmatrix} y-x & y^2-x^2 \\ z-x & z^2-x^2 \end{vmatrix}$$

$$= (y-x)(z-x)\begin{vmatrix} 1 & y+x \\ 1 & z+x \end{vmatrix}$$

$$= (y-x)(z-x)(z+x-y-x)$$

$$= (y-x)(z-x)(z-y)$$

$$= (x-y)(y-z)(z-x)$$

6. **Find a unit vector perpendicular to the plane containing points P(1, –1, 0), Q(2, 1, –1) and R(–1, 1, 2).**

Sol^n: Given points are P(1, –1, 0), Q(2, 1, –1) and R(–1, 1, 2).

Given that the points P, Q and R are contained in the plane.

So, the vector $\overrightarrow{PQ}$ and $\overrightarrow{PR}$ lie on the plane and the vector perpendicular to $\overrightarrow{PQ}$ and $\overrightarrow{PR}$ is $\overrightarrow{PQ} \times \overrightarrow{PR}$.

Therefore, the vector $\overrightarrow{PQ} \times \overrightarrow{PR}$ is perpendicular to the plane. And, the unit vector perpendicular to the plane is

$$\frac{1}{\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right|}\left(\overrightarrow{PQ} \times \overrightarrow{PR}\right).$$

Here, P(1, –1, 0), Q(2, 1, –1) and R(–1, 1, 2). So,

$$\overrightarrow{PQ} = \overrightarrow{OQ} - \overrightarrow{OP} = (2, 1, -1) - (1, -1, 0) = (2-1, 1-(-1), -1-0) = (1, 2, -1)$$

and,

$$\overrightarrow{PR} = \overrightarrow{OR} - \overrightarrow{OP} = (-1, 1, 2) - (1, -1, 0) = (-1-1, 1-(-1), 2-0) = (-2, 2, 2)$$

Then,

$$\overrightarrow{PQ} \times \overrightarrow{PR} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 2 & -1 \\ -2 & 2 & 2 \end{vmatrix}$$

$$= \vec{i}(4+2) - \vec{j}(2-2) + \vec{k}(2+4)$$

$$= 6\vec{i} + 6\vec{k}$$

Then,

$$\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right| = \sqrt{6^2 + 0^2 + 6^2} = 6\sqrt{2}$$

Now, the unit vector perpendicular to the plane containing the points P, Q, R is

$$\frac{1}{\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right|}\left(\overrightarrow{PQ} \times \overrightarrow{PR}\right) = \frac{1}{6\sqrt{2}}(6\vec{i} + 6\vec{k}) = \frac{1}{\sqrt{2}}(\vec{i} + \vec{k}).$$

7. **In how many ways can be letter of words "Sunday" be arranged? How many of these arrangement being with S? How many begin with S and don't end with y?**

Sol^n: In the given word **"SUNDAY"** there are 6 letters, in which no letter is repeated.

So, the total number of arrangements is

$$6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720 \text{ ways.}$$

If the arrangement begin with S, so S is fixed at first place. Then the numbers of arrangeable letters are 5.

So, the total number of arrangement that begin with S is 5! i.e. 120.

Therefore, the total numbers of arrangements do not begin with S

$$= \text{total number} - \text{number begin with S}$$
$$= 720 - 120$$
$$= 600$$

For next, we fixed S in first place and Y in last place, then we have rest 4 letters to arrangements. So the total number of words begin with S and end with Y is

$$4! = 24.$$

Thus, the total number of word begin with S and do not end with Y is

$$120 - 24 = 96 \text{ ways.}$$

8. **If $X + iy = \sqrt{\frac{1+i}{1-i}}$ then show that $x^2 + y^2 = 1$.**

Sol^n:

Let,

$$x + iy = \sqrt{\frac{1+i}{1-i}}$$

So,

$$|x + iy| = \sqrt{\left|\frac{1+i}{1-i}\right|}$$

$$\Rightarrow \sqrt{x^2 + y^2} = \sqrt{\frac{|1+i|}{|1-i|}} = \sqrt{\frac{(1)^2 + (1)^2}{(1)^2 + (-1)^2}} = \sqrt{\frac{2}{2}} = 1.$$

Thus, $x^2 + y^2 = 1$.

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. a. **Define Conic section. Find the coordinates of vertices, eccentricity and foci of the ellipse, $9x^2 + 4y^2 - 18x - 16y - 11 = 0$.** [1+5]

Sol^n: **<u>Definition of Conic Section</u>**

A conic section is a locus of a point which has the constant ratio of distance form a fixed point with distance from a fixed line. That is,

$$\frac{\text{Distance from a fixed point}}{\text{Distance from a fixed line}} = \text{constant ratio.}$$

Problem Part:

The given equation is

$$9x^2 + 4y^2 - 18x - 16y - 11 = 0$$

$$\Rightarrow \quad 9(x^2 - 2x + 1) - 9 + 4(y^2 - 4y + 4) - 16 - 11 = 0$$

$$\Rightarrow \quad 9(x-1)^2 + 4(y-2)^2 - 36 = 0$$

$$\Rightarrow \quad 9(x-1)^2 + 4(y-2)^2 = 36$$

$$\Rightarrow \quad \frac{9(x-1)^2}{36} + \frac{4(y-2)^2}{36} = 1$$

$$\Rightarrow \quad \frac{(x-1)^2}{4} + \frac{(y-2)^2}{9} = 1 \qquad \ldots (1)$$

Comparing equation (1) with $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$, we get

$$a = 2, b = 3, h = 1, k = 2$$

This shows $a < b$. So, major axis is parallel to y–axis.

Therefore,

$$\text{Centre, } (h, k) = (1, 2).$$

And,

$$\text{Vertices, } (h, k \pm b) = (1, 2 \pm 3) = (1, -1) \text{ and } (1, 5)$$

$$\text{Eccentricity, } e = \frac{\sqrt{b^2 - a^2}}{b} = \frac{\sqrt{9-4}}{3} = \frac{\sqrt{5}}{3}$$

$$\text{Foci, } (h, k \pm be) = \left(1, 2 \pm 2 \times \frac{\sqrt{5}}{3}\right) = \left(1, 2 \pm \frac{2\sqrt{5}}{3}\right).$$

9. b. If T: $R^2 \to R^3$ defined by $T(x_1, x_2) = (x_1 + x_2, x_2, x_1)$ be the linear transformation, then find matrix associated with linear map T. [4]

Sol^n:

Let, $T : \mathbb{R}^2 \to \mathbb{R}^3$ defined by $T(x_1, x_2) = (x_1 + x_2, x_2, x_1)$, is linear.

Here,

$$T(x) = T\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} x_1 + x_2 \\ x_2 \\ x_1 \end{bmatrix}$$

$$= \begin{bmatrix} x_1 + x_2 \\ 0x_1 + x_2 \\ x_1 + 0x_2 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$= Ax$$

So, the matrix, $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$ is the matrix associate with T.

10. a. Define irrational number. Prove that $\sqrt{2}$ is an irrational number. [1 + 4]

Sol^n: If possible, let suppose that $\sqrt{2}$ is a rational then by definition $\sqrt{2} = \frac{p}{q}$

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where $p, q \in Z$, $q \neq 0$, p and q have no common factor.

Squaring both sides

$$2 = \frac{p^2}{q^2} \Rightarrow p^2 = 2q^2 \qquad \text{..... (i)}$$

which shows that p^2 is multiple of 2.

So, p is also multiple of 2. So, let $p = 2k$, k is any integer.

Then (i) becomes

$$(2k)^2 = 2q^2 \Rightarrow q^2 = 2k^2$$

which shows that q^2 is also multiple of 2 so, q is which contradict our assumption that p and q have no common factor.

Hence, $\sqrt{2}$ is not rational number i.e. irrational.

10. * b. If function $f : R \to R$ defined by $f(x) = 2x + 1$ and $g : R \to R$ defined by $g(x) = x^2 - 2$. Find the formulae for composite functions $f * g$ and $g * f$ and also verify that $f * g \neq g * f$. [4 + 1]

Sol^n: Let,

$$f(x) = 2x + 1 \text{ and } g(x) = x^2 - 2.$$

Now,

$$\begin{aligned}(f \circ g)(x) = f(g(x)) &= f(x^2 - 2)\\ &= 2(x^2 - 2) + 1\\ &= 2x^2 - 4 + 1\\ &= 2x^2 - 3 \qquad \text{... (i)}\end{aligned}$$

and,

$$\begin{aligned}(g \circ f)(x) = g(f(x)) &= g(2x + 1)\\ &= (2x + 1)^2 - 2\\ &= 4x^2 + 4x + 1 - 2\\ &= 4x^2 + 4x - 1 \qquad \text{... (ii)}\end{aligned}$$

From (i) and (ii) we get, $(f \circ g)(x) \neq (g \circ f)(x)$.

11. a. If arithmetic mean, geometric mean and harmonic mean between two unequal positive numbers are A, G, H respectively. Then prove that $A > G > H$. [4]

Sol^n:

Let, arithmetic mean, geometric mean and harmonic mean between two unequal positive numbers are A, G, H respectively. Let a and b are two unequal positive numbers. Then

$$A = \frac{a + b}{2}, \qquad G = \sqrt{ab} \qquad \text{and} \qquad H = \frac{2ab}{a + b}$$

Here,

$$\begin{aligned}A - G = \frac{a + b}{2} - \sqrt{ab} &= \frac{a + b - 2\sqrt{ab}}{2}\\ &= \frac{(\sqrt{a})^2 + (\sqrt{b})^2 - 2\sqrt{a}\sqrt{b}}{2}\\ &= \frac{(\sqrt{a} - \sqrt{b})^2}{2}\\ &> 0 \qquad (\because a \neq b, a, b > 0)\end{aligned}$$

$$\Rightarrow \quad A > G \qquad \text{... (i)}$$

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And,

$$\begin{aligned} G - H &= \sqrt{ab} - \frac{2ab}{a+b} \\ &= \sqrt{ab}\left(1 - \frac{2\sqrt{ab}}{a+b}\right) \\ &= \sqrt{ab}\left(\frac{a+b-2\sqrt{a}\sqrt{b}}{a+b}\right) \\ &= \frac{\sqrt{ab}}{a+b}(\sqrt{a}-\sqrt{b})^2 \qquad (\because a \neq b,\ a, b > 0) \\ &> 0 \\ \Rightarrow \quad G &> H \qquad \ldots \text{(ii)} \end{aligned}$$

From (i) and (ii) we get, $A > G > H$.

11. b. What is the relation between permutation and combination of n objects taken r at a time? A committee of 5 is to be constituted from 6 boys and 5 girls. In how many ways can this be done so as to include at least a boy and a girl? [1 + 5]

Sol^n: (Relation between permutation and combination)

Since the permutation of n different things taken r at a time is denoted by ${}^nP_r$ or P(n, r), is given by

$$P(n, r) = \frac{n!}{(n-r)!}.$$

And, the combinations of n different things taken r at a time is denoted by ${}^nC_r$ or C(n, r), is given by

$$C(n, r) = \frac{n!}{r!(n-r)!}.$$

Then the relation between permutation and combination of n objects taken r at a time is

$$P(n, r) = r! \times C(n, r)$$

Problem Part:

Here, we have to form a committee of 5 from 6 boys and 5 girls that consists at least 1 boy and 4 girls. The way of selection is as:

No. of boy	No. of girl	No. of ways
1	4	$C(6, 1) \times C(5, 4)$
2	3	$C(6, 2) \times C(5, 3)$
3	2	$C(6, 3) \times C(5, 2)$
4	1	$C(6, 4) \times C(5, 1)$

Hence, total number of committees that can be formed is

$$\begin{aligned} &= C(6, 1) \times C(5, 4) + C(6, 2) \times C(5, 3) + C(6, 3) \times C(5, 2) + C(6, 4) \times C(5, 1) \\ &= 6 \times 5 + 15 \times 10 + 20 \times 10 + 15 \times 5 \\ &= 30 + 150 + 200 + 75 \\ &= 455. \end{aligned}$$

MODEL QUESTIONS SETS FOR PRACTICE

MODEL SET 1

Bachelor in Computer Applications — Full Marks: 60
Course Title: Mathematics — Pass Marks: 24
Code No: CAMT 104 — Time: 3 hrs.
Semester: First

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group A

Attempt ALL the questions: **[10×1 = 10]**

1. Circle (O) the correct answer in the following questions.

i. $A \Delta B$ is equal to
(a) $(A - B) \cap (B - A)$ (b) $(A - B) \cup (B - A)$
(c) $A \cap (B - A)$ (d) $B \cup (B - A)$

ii. If $A = \{x: x \leq 6\}$, $B = \{x: x \geq 5\}$ then $A \cup B =$
(a) $\{x: 5 \leq x \leq 6\}$ (b) $\{x: 5 < x < 6\}$
(c) $\{x: 5 < x \leq 6\}$ (d) $\{x: 5 \leq x < 6\}$

iii. If $R = \{(a, a), (b, b), (a, b), (b, a)\}$ then the relation is
(a) Reflexive (b) reflexive and symmetric
(c) Reflexive, symmetric and transitive (d) None of them

iv. If ${}^nC_r = 120$, ${}^nP_r = 720$ then the value of r is
(a) 3 (b) 6 (c) 7 (d) 8

v. If a, b, c are in H.P. then b is
(a) $\frac{a+b}{2ab}$ (b) $\frac{a+c}{2ac}$ (c) $\frac{2ac}{a+c}$ (d) $\frac{2ab}{a+b}$

vi. If $t_n = 2n + 3$ then s_{10} is
(a) 120 (b) 130 (c) 140 (d) 150

vii. The matrix satisfying the equation $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$ is
(a) $\begin{bmatrix} 1 & 4 \\ 0 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 4 \\ -1 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & -4 \\ 1 & 0 \end{bmatrix}$ (d) None of these

viii. Which of the following conics has an eccentricity of unity?
(a) Circle (b) Parabola (c) Hyperbola (d) Ellipse

ix. How many permutations of the letters of the word "APPLE" be arranged?
(a) 30 (b) 40 (c) 50 (d) 60

x. Calculate the vector cross product $a \times b$ when $a = 3i + j - 2k$ and $b = 4i - j$.
(a) $-2i - 8j - 7k$ (b) $-2i + 8j - 7k$
(c) $2i - 8j + 7k$ (d) $4j + 2k$

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Group B

Attempt any SIX questions: [6×5 = 30]

2. 40 students play football and 60 students play volleyball. It is found that 25 students play both the games. Find the number of students playing at least one game. [*Ans: 75*]

3. When does an inverse of a function exist? If $f : R \to R$ be defined by $f(x) = x^3 + 5$, find the formula that defines f^{-1}. [*Ans:* $f^{-1}(x) = \sqrt[3]{x-5}$]

4. Find the value of k such that k + 9, k − 6 and 4 form the three consecutive terms of a G.P. [*Ans: 0 or 16*]

5. If $A = \begin{pmatrix} 1 & 0 & 2 \\ 2 & 1 & 3 \\ 3 & 4 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 3 & 2 \\ 2 & 0 & 1 \\ 1 & -1 & 0 \end{pmatrix}$, verify that $(AB)^T = B^T A^T$.

6. If A is 7×9 matrix with two dimension null space what is a rank of A.

7. Find the coordinate of centre, eccentricity and foci of $x^2 + 4y^2 - 4x + 24y + 24 = 0$ [*Ans: centre (2, −3), eccentricity* $= \frac{\sqrt{3}}{2}$, *foci* $(2 \pm 2\sqrt{3}, -3)$]

8. In how many ways can a team of 5 players be selected from a group of 12 players? [*Ans: 792*]

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. Define a set. In a group of 50 students, 25 play hockey, 30 play football and 8 play neither hockey nor football. Find the number of students who play both the games. [*Ans: 13*]

10. Define a matrix. What is the meaning of a determinant of a matrix. Find the adjoint of the following matrices: $\begin{pmatrix} 1 & -1 & 2 \\ 2 & 3 & 5 \\ -2 & 0 & 1 \end{pmatrix}$.

[*Ans:* $\begin{pmatrix} 3 & 1 & -11 \\ -12 & 5 & -1 \\ 6 & 2 & 5 \end{pmatrix}$]

11. a. Define a conic and classify the conic as its eccentricity. Identify the conic $r = \frac{6}{3 + 2\sin\theta}$ with focus at the origin, the directrix, and the eccentricity. [*Ans: ellipse,* $y = -3, \frac{2}{3}$] [6]

b. In how many ways can 4 boys and 4 girls be arranged alternatively in round table? [*Ans:* 144] [4]

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MODEL SET 2

Group A

Attempt all the questions: **[10×1 = 10]**

1. **Circle (O) the correct answer in the following questions.**

i. The total number of students of a finite set containing n elements is
(a) 4^n (b) 2^n (c) 3^n (d) 1^n

ii. $-4 \le x \le -1$ implies
(a) $|2x+5| < 3$ (b) $|x+5| \le 1$ (c) $|2x+5| \le 1$ (d) $|2x+5| \le 3$

iii. If A = {1, 2, 3, 4}, the relation A×A determined by x + y < 3 is
(a) {(1, 1)} (b) {(1, 2), (2, 1)}
(c) {(1, 1), (1, 2), (2, 1)} (d) {(1, 1), (1, 2), (1, 3), (1, 4)}

iv. If f(x) = 2x + 3 then $f^{-1}(x)$ is
(a) $\frac{x+3}{2}$ (b) $\frac{x+2}{3}$ (c) $\frac{x-2}{3}$ (d) $\frac{x-3}{2}$

v. The sum of 40 AM's between two numbers is 120. The sum of 50 AM's between them is
(a) 150 (b) 120 (c) 140 (d) 160

vi. The nth term of the series 1 + 3 + 5 + ... is
(a) n (b) 2n (c) 2n – 1 (d) 2n + 1

vii. If A_{ij} and M_{ij} are cofactor and minor of a_{ij} respectively then
(a) $A_{ij} = -M_{ij}$ (b) $A_{ij} = M_{ij}$
(c) $A_{ij} = (-1)^{i+j} M_{ij}$ (d) $A_{ij} = (-1)^{ij} M_{ij}$

viii. If A is a square matrix of order two then |adj. A| is equal to
(a) |A| (b) $|A|^2$ (c) 1 (d) None of these

ix. If the distance from the focus is 10 units and the distance from the directrix is 30 units, then what is the eccentricity?
(a) 0.3333 (b) 0.8333 (c) 1.6667 d) 0.0333

x. If ${}^nP_4 = 12 \times {}^nP_2$ then the value of n is
(a) 3 (b) 4 (c) 5 (d) 6

Group B

Attempt any SIX questions: **[6×5 = 30]**

2. Find the modulus of : $\frac{2+3i}{3+4i}$ [*Ans:* $\frac{\sqrt{13}}{5}$]

3. Let h: R→R where R is the set of real numbers be defined by h(x) = x + 1 for all x ∈ R. Show that h is bijective.

4. In an arithmetic sequence, if the sixth term is equal to 3 times the third term and the sum of the first three terms is –12, find the A.P. [*Ans: –12, –4, 4, ...*]

5. Find the rank of following matrices: $A = \begin{bmatrix} 2 & -3 & 6 & 2 \\ -2 & 3 & -3 & -3 \\ 4 & -6 & 9 & 5 \\ -2 & 3 & 3 & -4 \end{bmatrix}$. [*Ans: 3*]

6. In how many ways can 6 players be selected from 7 men and 5 ladies consisting of 4 men and 2 ladies? [*Ans: 350*]

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7. In how many ways can the letters of the word 'ARRANGE' be arranged so that no two R's come together. [Ans: 900]

8. Find the centre, eccentricity, foci and the directrix of the hyperbola: $9x^2 - 16y^2 - 72x + 96y - 144 = 0$.

[Ans: $V(5, -2), V(-3, -2), e = 1.25, F(6, -2), F(-4, -2)$]

Group 'C'

Attempt any TWO questions. **[2×10=20]**

9. If $a^2 + b^2 = 7ab$, prove that $\log\left(\frac{a+b}{3}\right) = \frac{1}{2}(\log a + \log b)$.

10. Sum to infinity: $\frac{a}{x} + \frac{b}{x^2} + \frac{a}{x^3} + \frac{b}{x^4} + \ldots \infty$ where $|x| > 1$. [Ans: $\frac{ax+b}{x^2-1}$]

11. Define matrix, equal matrix, symmetric matrix and skew symmetric matrix. Express the matrix $A = \begin{pmatrix} 2 & 1 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$ as a sum of a symmetric matrix and a skew symmetric matrix.

[Ans: $A = \begin{pmatrix} 2 & 5/2 & 5 \\ 5/2 & 5 & 7 \\ 5 & 7 & 9 \end{pmatrix} + \begin{pmatrix} 0 & -3/2 & -2 \\ 3/2 & 0 & -1 \\ 2 & 1 & 0 \end{pmatrix}$]

MODEL SET 3

Group A

Attempt all the questions: **[10×1 = 10]**

1. Circle (O) the correct answer in the following questions.

i. $|z_1 + z_2| \leq |z_1| + |z_2|$ is known as
(a) triangle inequality (b) Morgan's second law
(c) distributive law (d) none of these

ii. If $A = \{2, 4, 6\}$, $B = \{a, b, c\}$ then
(a) $A = B$ (b) $A \approx B$
(c) $A \cup B \neq \phi$ (d) A and B are infinite

iii. If $f = \{(1, 1), (2, 2), (3, 3)\}$ then f represents
(a) constant function (b) identity function
(c) quadratic function (d) linear function

iv. The function $f: N \to N$, where N is the set of natural numbers, defined by $f(x) = 2x + 1$ is
(a) surjective (b) injective (c) bijective (b) none of these

v. The general term of GM is given by $t_n = 3(2^n)$ for $n \in N$ then the common ratio is
(a) 4 (b) 3 (c) 2 (d) 1

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vi. If $\begin{bmatrix} 7 & 5 \\ 8 & -2 \end{bmatrix} = \begin{bmatrix} 7 & 5 \\ x & x+y \end{bmatrix}$ then the value of y is

(a) 8 (b) −2 (c) 10 (d) −10

vii. Find the polar equation of the circle of radius 3 units and center at (3, 0).

(a) $r = 3\cos\theta$ (b) $r = 3\sin\theta$

(c) $r = 6\cos\theta$ (d) $r = 9\sin\theta$

viii. Given that u is a vector of magnitude 2, v is a vector of magnitude 3 and the angle between them is 45° what is u.v?

(a) 4.5 (b) 6.2 (c) 4.2 (d) 5.1

ix. If ${}^nP_r = 720\ {}^nc_r$ then r is equal to

(a) 6 (b) 5 (c) 4 (d) 7

x. A family of 5 brothers and 3 sisters is to be arranged in a row for a photograph. In how many ways can they be seated it all sisters sit together.

(a) 5! × 3! (b) 8! (c) 6! × 3! (d) 6!

Group B

Attempt any **SIX** questions: [6×5 = 30]

2. If z = 6 + 2i and w = 5 + i, verify that $\overline{z+w} = \bar{z} + \bar{w}$.

3. If $a^2 + b^2 = 7ab$, prove that $\log\left(\frac{a+b}{3}\right) = \frac{1}{2}(\log a + \log b)$.

4. A man saved Rs 16,500 in 10 years. In each year after the first he saved Rs 100 more than he did in the preceeding year. How much did he save in the first year? [*Ans: Rs 1,200*]

5. Find the rank of $A = \begin{bmatrix} 1 & -4 & 9 & -7 \\ -1 & 2 & -4 & 1 \\ 5 & -6 & 10 & 7 \end{bmatrix}$. [*Ans: 2*]

6. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 5 & 3 \\ 1 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 3 & 2 \\ 9 & 1 \end{pmatrix}$, prove that

(a) A + B = B + A (b) A(B + C) = AB + AC

7. In how many ways can the letter of the word "SUNDAY" be arranged? How many of these arrangements begin with S? How many begin with S and don't end with Y? [*Ans: 96*]

8. Without expanding, prove that $\begin{vmatrix} bc & a & a^2 \\ ca & b & b^2 \\ ab & c & c^2 \end{vmatrix} = \begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$.

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. a. In a group of 50 students, 25 play hockey, 30 play football and 8 play neither hokey nor football. Find the number of students who play both the games. [Ans: 13] [4]

b. Define scalar and vector product of two vectors. By using vector method, show that $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$. [6]

10. Define Taylor's series and Maclaurin's series of a function f(x) at a point. Find the Taylor's polynomial and Maclaurin's polynomial of order 3 generated by f(x) where, $f(x) = \cos x$ at $a = \frac{\pi}{2}$.

[Ans: $P_3(x) = \frac{1}{\sqrt{2}}\left[1 + \left(x - \frac{\pi}{2}\right) + \frac{1}{2!}\left(x - \frac{\pi}{2}\right)^2 + \frac{1}{3!}\left(x - \frac{\pi}{2}\right)^3\right]$,

$P_3(x) = \frac{1}{\sqrt{2}}\left[1 + x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3\right]$]

11. A committee of 5 is to be formed from 6 gentlemen and 4 ladies. In how many ways can it be done when
(a) at least two ladies are included?
(b) at most 2 ladies are included?

[Ans: 186, 186]

MODEL SET 4

Group A

Attempt all the questions:

1. Circle (O) the correct answer in the following questions. **[10×1 = 10]**

i. Which one of the following is true?
(a) $\phi = 0$ (b) $\phi = \{\ \}$ (c) $\phi = \{\phi\}$ (d) $\phi = \{0\}$

ii. De–Morgan's law states
(a) $(A - B)^C = A^C - B^C$ (b) $(A \cup B)^C = A^C \cup B^C$
(c) $(A \cup B)^C = A \cup B^C$ (d) $(A \cup B)^C = A^C \cup B^C$

iii. If S be the set of straight line in a plane then relation R is defined by "a is perpendicular to b" is
(a) reflexive relation (b) symetric relation
(c) transitive relation (d) equivalence relation

iv. If $f(x) = \begin{cases} 2x - 3 & \text{if } x \geq 2 \\ x & \text{if } x < 2 \end{cases}$ then f(1) is equal to
(a) 2 f(2) (b) f(2) (c) $\frac{1}{2}$ f(2) (d) – f(2)

v. If $a^x = b^y = c^z$ and x, y, z are in H.P., then a, b, c are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

vi. If A is a square matrix then A.adj(A) = adj(A) . A is

(a) 3A (b) |A| (c) 4|A| (d) |A|.I

vii. If A is non-singular square matrix then

(a) $A = \frac{1}{\det(A)} \text{Adj}(A)$ (b) $A^{-1} = \frac{1}{\det(A)} \text{Adj}(A)$

(c) $A^{-1} = \frac{1}{\det(A)} A \text{ Adj}(A)$ (d) $A^{-1} = \frac{1}{A} \text{Adj}(A)$

viii. The line $y = mx + c$ intersects the circle $x^2 + y^2 = a^2$ at the most of _____ points.

(a) 1 (b) 2 (c) 3 (d) 4

ix. What is a.b if a = 3i – j and b = 2i + j + 4k?

(a) 3 (b) 5 (c) –2 (d) 0.4

x. There are 10 true – false questions, the nature of ways, in which they can be answered is

(a) 10! (b) 10 (c) 10^2 (d) 2^{10}

Group B

Attempt any **SIX** questions: [6×5 = 30]

2. If n(U) = 360, n(A) = 240, n(B) = 160. Find
   (i) the maximum value of $n(A \cup B)$
   (ii) the minimum value of $n(A \cup B)$
   (iii) maximum value of $n(A \cap B)$
   (iv) minimum value of $n(A \cap B)$. [*Ans: (i) 360 (ii) 240 (iii) 160 (iv) 40*]

3. Let $f : R \to R$ be defined by $f(x) = 2x + 1$ and $g: R \to R$ be defined by $g(x) = x^2 - 2$. Find the formulae for *fof* and gog. [*Ans:* $\frac{x+7}{4}, \frac{x-5}{3}$]

4. The sum of three numbers in A.P. is 21 and sum of their squares is 155. Find the numbers. [*Ans: 5, 7, 9 or 9, 7, 5*]

5. Verify the relation A(Adj. A) = (Adj. A) A = |A| I, if $A = \begin{pmatrix} 3 & 5 & 1 \\ 2 & 0 & 4 \\ 1 & 6 & 2 \end{pmatrix}$

6. Let $A = \begin{bmatrix} 1 & -5 & -7 \\ -3 & 7 & 5 \end{bmatrix}$, $b = \begin{bmatrix} -2 \\ -2 \end{bmatrix}$. Define T by T(x) = Ax. Find a vector x whose image under T is b. [*Ans:* $\begin{bmatrix} 3 \\ 1 \\ 0 \end{bmatrix}$]

7. How many numbers of six digits, all different, can be formed from the integers 2, 3, 4, 5, 6 and 7? How many of these are divisible by 5? How many are not divisible by 5? [*Ans: 720, 120, 600*]

8. Evaluate: $2 \log_5 (\sqrt{5}) + 3 \log_2 (8)$. [*Ans: 10*]

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. a. Solve the inequality $|1 - 2x| \geq 3$. [*Ans:* $(-\infty, -1] \cup [2, \infty)$] [5]

   b. Prove that: $\frac{5a + 6b}{a + b}$ lies between 5 and 6, when $a, b \in Q^+$. [5]

10. Define vector product of two vectors and give its geometrical meaning. By vectorically, find area of a triangle whose vertices are (1, –2), (1, 2) and (–3, 1). [*Ans:* 16]

11. a. If $x = \frac{1}{1 + y}$ for $y > 0$ then prove that $\frac{1}{y} = x + x^2 + x^3 + \ldots \infty$. [4]

    b. Define permutation and combination. In how many ways can the letters of the word 'EXAMINATION' be arranged? [*Ans:* 4989600] [6]

MODEL SET 5

Group A

Attempt all the questions:

1. Circle (O) the correct answer in the following questions. [10×1 = 10]

i. If $a, b, c \in R$ then $a + b = b + c \Rightarrow a = b$ is the
   (a) associative property (b) cancellation property
   (c) additive property (d) additive inverse

ii. If $A = \{1, 2, 3, 4\}$, $B = \{2, 3, 5, 7\}$ and $C = \{1, 3, 5, 6\}$, then $A \cap (B \Delta C)$ is
   (a) $A \cap B$ (b) $(A \cap B) \Delta (A \cap C)$
   (c) $B \Delta C$ (d) none of these

iii. Which of the following is true?
   (a) $A \times B = \{(b, a) : a \in A, a \in B\}$ (b) $A \times B = \{x^2 : x \in A, x \in B\}$
   (c) $A \times B = \{(a, b) : a \in A, b \in B\}$ (d) $A \times B = \{(a, b) : a \in B, b \in A\}$

iv. Which one of the following properties on logarethmic is correct
   (a) $\log_a(xy) = \log_a(x) + \log_a(y)$ (b) $\log_a(x.y) = \log_a(x) . \log_a(y)$
   (c) $\log_a(x + y) = \log_a(x) + \log_a(y)$ (d) $\log_a(x - y) = \log_a(x) - \log_a(y)$

v. A matrix transformation $T(V) = AV$ is orthogonal if
   (a) $A^T = -A$ (b) $A^T = A$ (c) $A^t = i$ (d) $A^T = A^{-1}$

vi. The rank of matrix $\begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$ is
   (a) 0 (b) 1 (c) 2 (d) 3

vii. If the value of eccentricity is 12, then what is the name of the conic?
   (a) Ellipse (b) Hyperbola (c) Parabola (d) Circle

viii. If ${}^nC_2 = {}^nC_3$ then the value of ${}^nC_4$ is
   (a) 2 (b) 3 (c) 5 (d) 4

ix. In how many ways 8 people and host be seated in a circular table of a party.
   a. 8! b. 9! c. 7! d. 6!

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x. The number of ways in which four boys and 4 girls can be seated at round table so that no two girls may be together is
(a) 576 (b) 48 (c) 16 (d) 144

Group B

Attempt any **SIX** questions: [6×5 = 30]

2. Prove that (i) $|x+y| \le |x| + |y|$ (ii) $|x-y| \ge |x| - |y|$.

3. If $\frac{\ln x}{y-z} = \frac{\ln y}{z-x} = \frac{\ln z}{x-y}$, prove that $xyz = 1$.

4. In an arithmetic sequence, the 4th and 15th terms are 11 and 44 respectively. Find
   (i) the first term and the common difference.
   (ii) the 20th term. [*Ans: 3, 2, 59*]

5. Show that the matrix $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal.

6. Show that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$.

7. In how many ways can 6 red ball, 4 white ball and 2 blue balls be arranged in a row? [*Ans: 13860*]

8. Convert Cartesian coordinates $(-1, -\sqrt{3})$ to polar coordinates. [*Ans:* $\frac{4}{3}\pi$]

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. Define one-to-one and onto function. Prove that the function $f: Q \to Q$ where Q is the set of rational numbers defined by $y = f(x) = 2x - 3$ for all $x \in Q$ is both one to one and onto.

10. a. A clothing store has three branches. If matrix A represents the number of slacks, jackets and suits which are ordered for their three branches. If matrix B represents the number of slacks, jackets and suits which are sold from their three branches.

$$A = \begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} \text{Slacks} & \text{Jackets} & \text{Suit} \end{array} \\ \begin{bmatrix} 78 & 80 & 75 \\ 68 & 75 & 80 \\ 88 & 90 & 95 \end{bmatrix} \end{array} \qquad B = \begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array}\begin{array}{c} \begin{array}{ccc} \text{Slacks} & \text{Jackets} & \text{Suit} \end{array} \\ \begin{bmatrix} 40 & 42 & 60 \\ 30 & 35 & 60 \\ 65 & 80 & 10 \end{bmatrix} \end{array}$$

Using matrix algebra, [6]

i. Find the stock of store of each branch with each cloth.
ii. If purchasing price for each slack is Rs. 350, jacket is 400 and suit is 550 then find the total cost for each branches.
iii. If selling price for each slack is Rs. 425, jacket is 475 and suits is 650 then find the total revenue collection on each branch.

[*Ans:* (i) $\begin{bmatrix} 38 & 38 & 15 \\ 38 & 40 & 20 \\ 23 & 10 & 85 \end{bmatrix}$ (ii) $\begin{bmatrix} 100550 \\ 97800 \\ 119050 \end{bmatrix}$ (iii) $\begin{bmatrix} 75950 \\ 68375 \\ 72125 \end{bmatrix}$]

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b. Show that the vectors $\vec{i} - \vec{j}, 2\vec{k}, -3\vec{i} + 2\vec{j} - \vec{k}$ and $4\vec{i} + \vec{j} + \vec{k}$ are coplanar. [4]

11. From 12 persons in how many ways can a selection of 6 be made
(i) When two particular persons are always included
(ii) When two particular persons are always excluded.

[*Ans: 210, 210*]

MODEL SET 6

Group A

Attempt all the questions: **[10×1 = 10]**

1. Circle (O) the correct answer in the following questions.

i. If A = [–1, 3) and B = [2, 5], then A – B is equal to
(a) [–1, 2) (b) [–1, –2] (c) [–1, –2) (d) [–1, 3]

ii. If A = {1, 2, 3, 4} then
(a) $a \in A$ (b) $1 \subset A$ (c) $1 \not\subset A$ (d) $4 \in A$

iii. If z = a + ib then $\bar{z}$ is
(a) z – ib (b) a – ib (c) $\frac{1}{a+ib}$ (d) $\frac{1}{a-ib}$

iv. Let R is the relation of 'is parallel to' on the set of line in the plane then R is
(a) reflexive (b) symmetric (c) transitive (d) equivalence

v. If x, y, z are in A.P. then $\frac{1}{yz}, \frac{1}{zx}, \frac{1}{xy}$ are in
(a) A.P. (b) G.P. (c) H.P. (d) None of these

vi. The taylor series of sinx at x = 0 is
(a) $\Sigma\left(\frac{x^{2n}}{n!}\right)$ (b) $\Sigma\frac{x^{2n}}{(2n)!}$ (c) $\Sigma\frac{x^{2n-1}}{(2n-1)!}$ (d) $\Sigma\frac{x^{n-1}}{(n-1)!}$

vii. A matrix $\begin{bmatrix} 5 & 4 & 2 \\ 4 & 6 & 1 \\ 2 & 1 & 4 \end{bmatrix}$ is a
(a) square matrix (b) symmetric matrix
(c) skew symmetric matrix (d) diagonal matrix

viii. If A and B be two square matrices such that AB = 0 then
(a) |A| = 0 or |B| = 0 (b) |A| = 0
(c) |B| = 0 (d) $B = A^{-1}$

ix. The focus of the parabola $y^2 = 16x$ is at
(a) (4, 0) (b) (0, 4) (c) (3, 0) (d) (0, 3)

x. If ${}^nP_2 = 12$ then value of n is
(a) 5 (b) 4 (c) 6 (d) 3

Group B

Attempt any **SIX** questions: [6×5 = 30]

2. If $z = 6 + 2i$ and $w = 5 + i$, verify that

   (i) $\overline{z + w} = \bar{z} + \bar{w}$ (ii) $\overline{z \cdot w} = \bar{z} \cdot \bar{w}$

3. Prove that the function $f : Q \to Q$ where Q is the set of rational numbers defined by $y = f(x) = 2x - 3$ for all $x \in Q$ is both one to one and onto.

4. Three numbers are in the ratio 1 : 4 : 12, if one is added to the first number, the resulting number together with the other two numbers form a G.P. Find the original three numbers. [*Ans: 3, 12, 36*]

5. Let $T(x_1, x_2) = (3x_1 + x_2, 5x_1 + 7x_2, x_1 + 3x_2)$.

   (i) Show that T is a one-to-one linear transformation.

   (ii) Does T maps R^2 onto R^3? [*Ans: not onto*]

6. Prove that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$.

7. In how many ways can 4 boys and 4 girls be arranged alternatively in a round table? [*Ans: 144*]

8. If $f(x) = \log\left(\frac{1-x}{1+x}\right)$ $(-1 < x < 1)$, show that $f\left(\frac{2ab}{1+a^2b^2}\right) = 2\,f(ab)$ where $|ab| < 1$.

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. a. Rewrite $-5 < x < 7$ using absolute sign. [*Ans:* $|x - 1| < 6$] [5]

   b. Solve the inequality $|1 - 2x| \geq 3$. [*Ans:* $(-\infty, -1] \cup [2, \infty)$] [5]

10. State the Maclaurin's series of a function f(x). By using Maclaurin series expansion, find the first six terms of a series for $\cos x$.

11. Define permutation and combination. Can we relate permutation to combination? Justify. A committee is to be chosen from 12 men and 8 women and is to consist of 3 men and 2 women. How many committees can be formed? [*Ans: 6160*]

MODEL SET 7

Group A

Attempt all the questions: [10×1 = 10]

1. Circle (O) the correct answer in the following questions.

i. The value of $\sqrt{-8} \times \sqrt{-2}$ is

   (a) 4 (b) −4 (c) 4i (d) −4i

ii. The domain of the function $f(x) = \frac{|x+2|}{x+2}$ is

   (a) R − {2} (b) R − {−2} (c) R − {0} (d) R

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iii. The equation $y = ax^2 + bx + c$ represents a parabola opening downwards if
(a) $a > 0$ (b) $a < 0$ (c) $a = 0$ (d) none of above

iv. If 3, x, 7 are in HP then the value of x is
(a) $\frac{15}{2}$ (b) $\frac{7}{4}$ (c) $\frac{21}{5}$ (d) $\frac{25}{4}$

v. The taylor's series of e^x at $x = 0$ is
(a) $\Sigma\left(\frac{x^n}{n!}\right)$ (b) $\Sigma\left(\frac{n!}{x^n}\right)$ (c) $\Sigma\, n!\, x^n$ (d) $\Sigma\, n^n x^n$

vi. In how many ways 6 rings of different types can be had in 4–fingers?
(a) 4^4 (b) 4^5 (c) 4^6 (d) 4^7

vii. If A and B are non–singular matrices then $(AB)^{-1} =$
(a) $(BA)^{-1}$ (b) $A^{-1}B^{-1}$ (c) $B^{-1}A^{-1}$ (d) none

viii. A matrix transformation $T(x) = Ax$ is orthogonal transformation if
(a) A^TA (b) $A^T = -A$ (c) $A^T = I$ (d) $A = I$

ix. If ${}^{21}C_r = {}^{21}C_{r+3}$ then value of r is
(a) 3 or 5 (b) 18 (c) 9 (d) 6

x. There are five letter boxes in a post office. In how many ways can a man post 8 distinct letters?
(a) 8×8 (b) 5^8 (c) 8^5 (d) ${}^8P_5$

Group B

Attempt any SIX questions: **[6×5 = 30]**

2. If U = {a, b, c, ..., g, h}, A = {a, b, c, d, e}, B = {a, c, e, g} and C = {b, e, f, g}; verify that $A - (B \cup C) = (A - B) - C$

3. Let Q be the set of rational numbers. Let $f : Q \to Q$ be defined by $f(x) = 2x + 3$ for all $x \in Q$. Show that f is one–one and onto. Also, find a formula that defines the inverse function f^{-1}.
[*Ans:* $f^{-1}(x) = \frac{x-3}{2}$]

4. The sum of the first three terms of a G.P. is 292 and its common ratio is 8. Find its first term. [*Ans: 4*]

5. Define a contraction map. Prove that contraction map is linear transformation.

6. Given the polar equation of a circle, convert it to Cartesian form $r^2 = -4r\cos(\theta)$. [*Ans:* $(x + 2)^2 + (y - 0)^2 = 2^2$]

7. Find r if $4 \times {}^{15}P_r = 3 \times {}^{16}P_r$. [*Ans: 4*]

8. A man has 5 friends. In how many ways can he invite one or more of them to a dinner? [*Ans: 31*]

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. Define linear transformation. Let $T: R^2 \to R^2$ be a linear transformation such that $T(x_1, x_2) = (x_1 + x_2, 4x_1 + 5x_2)$. Find x such that $T(x) = (3, 8)$.
[*Ans:* $\begin{bmatrix} 7 \\ -4 \end{bmatrix}$]

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10. Define eccentricity of a conic. Classify the conic as its eccentricity. Derive the standard equation of a ellipse has centre at (0, 0) and gives its equation of tangent.

11. A committee of 5 is to be formed from 6 gentlemen and 4 ladies. In how many ways can it be done when

(a) at least two ladies are included?

(b) at most 2 ladies are included? [*Ans: (i) 186 (ii) 186*]

MODEL SET 8

Group A

Attempt all the questions: **[10×1 = 10]**

1. Circle (O) the correct answer in the following questions.

i. If z and w are two complex numbers then $\overline{z + w}$ is

(a) $\leq \bar{z} + \bar{w}$ (b) $= \bar{z} + \bar{w}$ (c) $= z + w$ (d) $\leq z + w$

ii. If $y = f(x) = 7x - 10$, then $f^{-1}(x)$ is

(a) $7y - 10$ (b) $\frac{1}{7x - 10}$ (c) $\frac{x}{7} - 10$ (d) $\frac{x + 10}{7}$

iii. If the sum and the product of three numbers in A.P. are 15 and 80 respectively, the numbers are

(a) 2, 5, 8 (b) 1, 10, 4 (c) –2, 8, 9 (d) –2, 21, –4

iv. Sum of the series $1 + \frac{3}{2} + \frac{5}{4} + ...$ is

(a) 2 (b) 4 (c) 6 (d) 8

v. The Taylor series of e^{ax} at $x = 0$ is

(a) $a^n \Sigma \frac{x^n}{n!}$ (b) $\Sigma \frac{a^n x^n}{n!}$ (c) $\Sigma \frac{a^n n!}{x^n}$ (d) $\Sigma \frac{n!}{a^n x^n}$

vi. The inverse of the matrix $\begin{bmatrix} 2 & 3 \\ -4 & 7 \end{bmatrix}$ is

(a) $\begin{bmatrix} 7 & 4 \\ -3 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 7 & -3 \\ 4 & 2 \end{bmatrix}$ (c) $\frac{1}{26}\begin{bmatrix} -2 & -3 \\ 4 & -7 \end{bmatrix}$ (d) $\frac{1}{26}\begin{bmatrix} 7 & -3 \\ 4 & 2 \end{bmatrix}$

vii. What is the component of $a = 3i + j - k$ in the direction of $b = i - 2j + 6k$?

(a) – 0.78 (b) 1.23 (c) – 0.34 (d) – 0.51

viii. If ${}^nP_2 = 20$, then value of n is

(a) 3 (b) 4 (c) 5 (d) 6

ix. The GM between two numbers is 2 and k is 8 then the value of k is

(a) 42 (b) 35 (c) 34 (d) 32

x. In how many ways 7 different heads are strong on a necklace?

(a) 120 (b) 180 (c) 360 (d) 702

Group B

Attempt any **SIX** questions: [6×5 = 30]

2. If $n(U) = 150$, $n(A) = 100$, $n(B) = 65$, $n(A \cup B) = 110$, find $n(A \cap B)$, $n(A - B)$, $n(B - A)$ and $n(A \cup B)'$. Also, if $B \subset A$, find $n(A \cup B)$ and $n(A \cap B)$.

[*Ans: 55, 45, 10, 40, 100, 65*]

3. Evaluate: $2 \log_5 \sqrt{5} + 3 \log_2 8$. [*Ans: 10*]

4. Insert 3 geometric means between $\frac{3}{49}$ and 147. [*Ans:* $\frac{3}{7}$, 3, 21]

5. Let $A = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ be the given matrix and define $T: R^2 \to R^2$ by $T(x) = Ax$. Find the images under T of $u = \begin{bmatrix} 1 \\ -3 \end{bmatrix}$ and $v = \begin{bmatrix} a \\ b \end{bmatrix}$. [*Ans:* $\begin{bmatrix} 2a \\ 2b \end{bmatrix}$]

6. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$, show that $A^2 - 2A - 5I = 0$.

7. There are 12 questions in a question paper and a candidate has to answer any 6 of them. In how many ways can he do them if question numbers 1 and 2 are compulsory? [*Ans: 210*]

8. A boy has 7 pockets. In how many ways can be put 5 marbles in his pocket? [Ans: 7^5]

Group 'C'

Attempt any **TWO** questions. [2×10=20]

9. a. If $x - iy = \frac{5 - 6i}{5 + 6i}$, prove that $x^2 + y^2 = 1$. [5]

   b. Find the domain and range of $f(x) = \frac{x + 1}{x - 3}$. [*Ans:* $R - \{3\}$, $R - \{1\}$] [5]

10. a. Define scalar product of two and three vectors. Give the geometrical meaning of scalar product of three vectors. Also, state the condition for given three vectors is coplanar. [6]

    b. Change the polar coordinates $\left(5, \frac{\pi}{2}\right)$ into Cartesian coordinates. [4]

11. a. How many numbers of three digits all different and less than 500 can be formed from the integers 1, 2, 3, 4, 5, 6? [*Ans: 80*] [5]

    b. There are 12 questions in a question paper and a candidate has to answer any 6 of them. In how many ways can he do them if question numbers 1 and 2 are compulsory? [*Ans: 210*] [5]

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OBJECTIVE QUESTIONS ANSWERS KEY

SET 1

i. (b)	ii. (a)	iii. (c)	iv. (d)	v. (c)	vi.(c)	vii.(a)	viii. (b)	ix. (d)	x.(a)

SET 2

i. (b)	ii. (d)	iii. (a)	iv. (d)	v. (a)	vi.(c)	vii.(c)	viii. (a)	ix. (a)	x.(d)

SET 3

i. (a)	ii. (b)	iii. (d)	iv. (b)	v. (c)	vi.(d)	vii.(b)	viii. (c)	ix. (a)	x.(c)

SET 4

i. (b)	ii. (d)	iii. (c)	iv. (b)	v. (b)	vi.(d)	vii.(c)	viii. (b)	ix. (b)	x.(d)

SET 5

i. (b)	ii. (d)	iii. (c)	iv. (a)	v. (d)	vi.(a)	vii.(b)	viii. (c)	ix. (a)	x.(d)

SET 6

i. (a)	ii. (d)	iii. (b)	iv. (d)	v. (a)	vi.(c)	vii.(b)	viii. (a)	ix. (a)	x.(b)

SET 7

i. (c)	ii. (b)	iii. (b)	iv. (c)	v. (a)	vi.(c)	vii.(c)	viii. (a)	ix. (c)	x.(b)

SET 8

i. (b)	ii. (d)	iii. (a)	iv. (c)	v. (a)	vi.(d)	vii.(a)	viii. (c)	ix. (d)	x.(c)

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Digital Logic

New Syllabus

Course Title: Digital Logic
Year/Semester: I/I
(Theory: 3 hrs., Practical: 2 hrs.)

Course Code: CACS105
Class Load: 5 hrs. /week

Course Description:

This course presents an introduction to Digital logic techniques and its practical application in computer and digital system.

Course Objectives:

The course has the following specific objectives:

- To perform conversion among different number systems.
- To simplify logic functions
- To design combinational and sequential logic circuit
- To understand industrial application of logic system.
- To understand digital IC analysis and its application
- Designing of programmable memory

Course Contents

Unit 1: Introduction **2 hrs.**

1.1 Digital signals and wave forms
1.2 Digital logic and operation
1.3 Digital computer and integrated circuits (IC)
1.4 Clock wave form

Unit 2: Number Systems **5 hrs.**

2.1 Binary, Octal, & Hexadecimal Number Systems and Their conversions
2.1.1 Representation of Signed numbers-Floating Point number
2.1.2 Binary Arithmetic
2.2 Representation-of BCD-ASCII-Excess 3-Gray Code-Error Detecting and Correcting Codes

Unit 3: Combinational Logic Design **16 hrs.**

3.1 Basic Logic Gates NOT, OR and AND
3.2 Universal Logic Gates NOR and NAND
3.3 EX-OR and EX-NOR Gates
3.4 Boolean Algebra
3.3.1 Postulaes& Theorems
3.3.2 Canonical Forms- Simplification of Logic Functions
3.5 Simplification of Logic Functions Using Karnaugh Map
3.5.1 Analyusis of SOP and POS expression
3.6 Implementation of Combinational Logic Functions
3.6.1 Encoders & Decoders
3.6.2 Half Adder, & Full Adder
3.7 Implementation of Data Processing Circuits
3.7.1 Multiplexers and De-Multiplexers
3.7.2 Parallel Adder-Binary Adder-Parity Generator/Checkers-Implementation of Logical Functions using Multiplexers
3.8 Basic Concepts of Programmable Logic
3.8.1 PROM
3.8.2 EPROM
3.8.3 PAL
3.8.4 PLA

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Unit 4: Counters & Registers **16 hrs.**

4.1 RS, JK, JK Master- Slave, D & T Flip flops
- 4.1.1 Level Triggering and Edge Triggering
- 4.1.2 Excitation Tables

4.2 Asynchronous and Synchronous Counters
- 4.2.1 Ripple Counter: Circuit and State Diagram and Timing Waveforms
- 4.2.2 Ring Counter: Circuit and State Diagram and Timing Waveforms
- 4.2.3 Modulus 10 Counter: Circuit and State Diagram and Timing Waveforms
- 4.2.4 Modulus Counters (5, 7, 11) and Design Principle, Circuit and State Diagram
- 4.2.5 Synchronous Design of Above Counters, Circuit Diagrams and State Diagrams

4.3 Application of Counters
- 4.3.1 Digital Watch
- 4.3.2 Frequency Counter

4.4 Registers
- 4.4.1 Serial in Parallel out Register
- 4.4.2 Serial in serial out register
- 4.4.3 Parallel in serial out register
- 4.4.4 Parallel in parallel out register
- 4.4.5 Right shift, left shift register

Unit 5: Sequential Logic Design **6 hrs.**

5.1 Basic Models of Sequential Machines
- Concept of state
- State diagram

5.2 State reduction through partioning and implementation of synchronous sequential circuits

5.3 Use of flip-flops in realizing the models

5.4 Counter design

Laboratory Works

1. Gates using active and passive elements
2. Half adder and full adder
3. 16:1 multiplexer
4. 1:16 demultiplexer
5. Digital watch by counters
6. Shift registers

Teaching Methods

The general teaching methods includes class lectures, group discussions, case studies, guest lecturers, research work, project work, assignments (theoretical and practical), and exams, depending upon the nature of the topics. The teaching faculty will determine the choice of teaching pedagogy as the need of the topics.

Evaluation

Examination scheme				
Internal Assessment		External Assessment		
Theory	Practical	Theory	Practical	Total
20	20 (3 hrs.)	60 (3 hrs.)	-	100

Text Books:

1. Floyd, "Digital Fundamentals", PHI.
2. Morris Mano, "Digital Design", Prentice Hall of India.
3. Tocci R.J., "Digital systems- Principles & Applications" – Prentice Hall of India.

Reference Books:

1. B.R. Gupta and V. Singhal, "Digital Electronics" 4th Edition, S.K. Kataria& Sons, India.
2. Flctcher, W.I., "An Engineering Approach to Digital Design", Prentice Hall of India.
3. Millaman&Halkias, "Integrated Electronics."
4. V.K. PURI, "Digital Electronics", TMH.

TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

MODEL QUESTIONS-ANSWERS

Course Title: Digital Logic — Full Marks: 60
Course No: CACS105 — Pass Marks: 24
Nature of the Course: Theory + Lab — Time: 3
Semester: I

Group 'A'

Attempt all the questions. **10 × 1 = 10**

Circle (O) the correct answer in the following questions

1. The gray code 111 is equivalent to binary is.
   a) 1001 b) 1010 c) 1000 d) 1100
2. What is input of a de-multiplexer, which has 2 section bits.
   a) 8 b) 4 c) 1 d) 6
3. To find.....of an algebraic expression we simplify interchange OR and AND operations and replace 1's by 0's and 0's by 1's.
   a) Complement b) Dual
   c) Canonical from d) De Morgan's
4. The result of binary subtraction 110001011 - 11101101 is,
   a) 10010110 b) 10100110 c) 101101110 d) 10011110
5. The bit capacity of a memory that has 10 bit address input and can store 8 bits at each address is,
   a) 80 b) 8192 c) 800 d) 1024
6. The input of a 2 input gate is 0 if only if its inputs are unequal. It is true for,
   a) XNOR b) AND c) NOR d) NAND
7. The output of Boolean Function A + AB is,
   a) B b) O c) A d) A + B
8. How many clock pulses are required to enter a byte of data serially into an 8 bit shift register?
   a) 16 b) 18 c) 4 d) 1
9. A 10 MHz frequency is applied to a cascaded consisting of a modulus-5 counters, a modulus-8 counters, and two modulus-10 counters. The lowest output frequency possible is.
   a) 10 KHz b) 2.5 KHz c) 5 KHz d) 25 KHz
10. If an S–R latch has a 1 on the S input and O on the R input and then the S input goes to O, the latch will be.
    a) set b) reset c) toggle d) clear

Answer Key

1. c	2. a	3. b	4. d	5. b	6. a	7. d	8. b	9. d	10. b

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Group 'B'

Attempt any SIX questions. **(6x5=30)**

11. What is digital System? Write down the advantage and limitation of digital system. **[1 + 2 + 2]**

Ans: Digital System: Digital systems are designed to store, process, and communicate information in digital form. They are found in a wide range of applications, including process control, communication systems, digital instruments, and consumer products. The digital computer, more commonly called the *computer*, is an example of a typical digital system.

Advantage of Digital System

1. Easier to design. Exact values of voltage or current are not important, only the range (High or LOW)in which they fall.
2. Information storage is easy.
3. Accuracy and precision are greater.
4. Operation can be programmed. Analog systems can also be programmed, but the variety and complexity of the available operations is limited.
5. Digital circuits are less affected by noise. As long as the noise is not large enough to prevent us from distinguishing a High from a LOW.
6. More digital circuitry can be fabricated on IC chips.

12. Why NAND and NOR gates are called Universal Gates? Implement AND, OR and NOT Gates using NAND and NOR gates. **[1 + 2 + 2]**

Ans: A universal gate is a gate which can implement any Boolean function without need to use any other gate type. The NAND and NOR gates are universal gates. In practice, this is advantageous since NAND and NOR gates are economical and easier to fabricate and are the basic gates used inall IC digital logic families. Infact, an AND gate is typically implemented as a NAND gate followed by an inverter not the other way around. Likewise, an OR gate is typically implemented as a NOR gate followed by an inverter not the other way around.

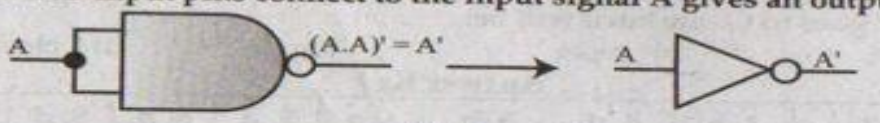
NAND Gate as a Universal Gate

To prove that any Boolean function can be implemented using only NAND gates, we will show that the AND, OR, and NOT operations can be performed using only the segates.

Implementing an Inverter Using only NAND Gate

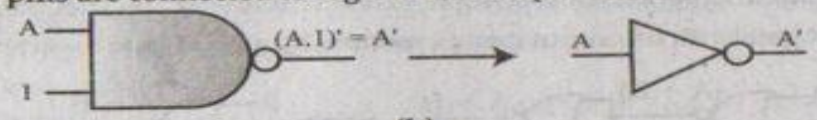
The figure shows two ways in which a NAND gate can be used as an inverter (NOT gate).

1. **All NAND input pins connect to the input signal A gives an output A'.**



(a)

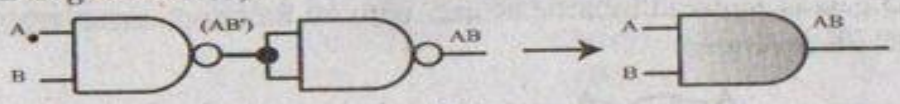
2. **One NAND input pin is connected to the input signal A while all other input pins are connected to logic 1. The output will be**



(b)

Implementing ANDU sing only NAND Gates

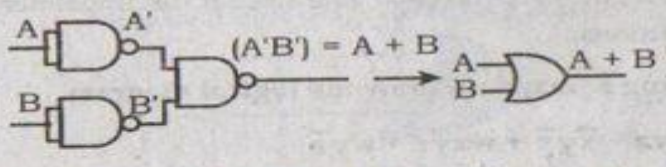
An AND gate can be replaced by NAND gates as shown in the figure (The AND is replaced by a NAND gate with its output complemented by a NAND gate inverter).



(c)

Implementing OR Using only NAND Gates

An OR gate can be replaced by NAND gates as shown in the figure (The OR gate is replaced by a NAND gate with all its inputs complemented by NAND gate inverters).

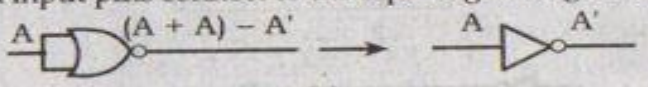


Thus, the NAND gate is a universal gates because it can implement the AND, OR and NOT functions.

NOR Gate is as Universal Gate

To prove that any Boolean function can be implemented using only NOR gates, we will show that the AND, OR, and NOT operations can be performed using only the segates. Implementing an Inverter Using only NOR Gate The figure shows two ways in which a NOR gate can be used as an inverter (NOT gate).

1. All NOR input pins connect to the input signal A gives an output A'.



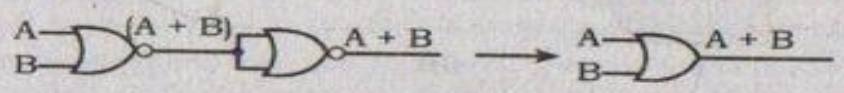
(a)

2. One NOR input pin is connected to the input signal A while all other input pins are connected to logic 0. The output will be A'.

(b)

Implementing OR Using only NOR Gates

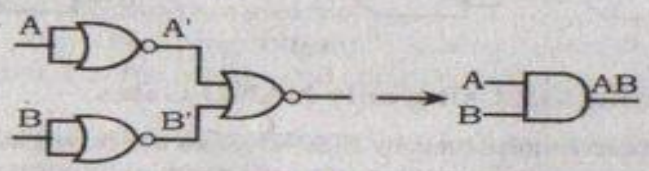
AnORgatecanbereplacedbyNORgatesasshowninthefigure(TheORisreplacedb ya NOR gate with its output complemented by a NOR gate inverter)



(c)

Implementing AND Using only NOR Gates

An AND gate can be replaced by NOR gates as shown in the figure (The AND gate is replaced by a NOR gate with all its inputs complemented by NOR gate inverters)



(d)

Thus, the NOR gate is a universal gate since it can implement the AND, OR and NOT functions..

13. Simplify using K-map and draw the logical diagram.

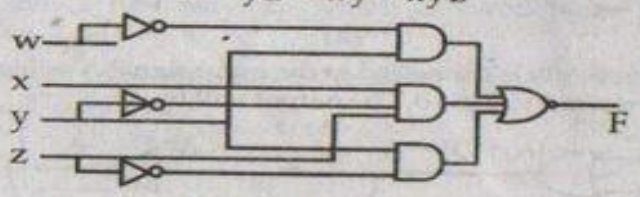
$F = \overline{w}xz + \overline{w}yz + \overline{x}y\overline{z} + wx\overline{y}z + wy\overline{z}$

Ans: Now, $F = \overline{w}xz + \overline{w}yz + \overline{x}y\overline{z} + wx\overline{y}z + wy\overline{z}$

k-map simplification

wx \ yz	00	01	11	10
00			1	1
01		1	1	1
11		1		1
10	1	1	1	1

$F = y\overline{z} + \overline{w}y + x\overline{y}z$



Logic diagram

14. Explain half adder. Implement full adder using two half adder and OR gate. **[1+4]**

Ans: A half adder is a logical circuit that performs an addition operation on two binary digits. The half adder produces a sum and a carry value which are both binary digits.

A half adder has two inputs, generally labelled A and B, and two outputs, the sum S and carry C. S is the two-bit XOR of A and B, and C is the AND of A and B. Essentially the output of a half adder is the sum of two one-bit numbers, with C being the most significant of these two outputs.

The drawback of this circuit is that in case of a multibit addition, it cannot include a carry.

Table 3.1: Truth table of half adder.

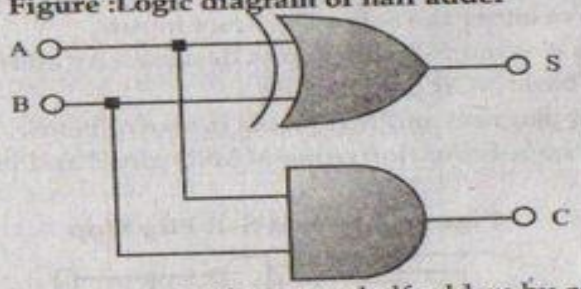
A	B	Carry	Sum
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

Equation of the Sum and Carry

Sum=A'B+AB'= $A \oplus B$ Carry=AB

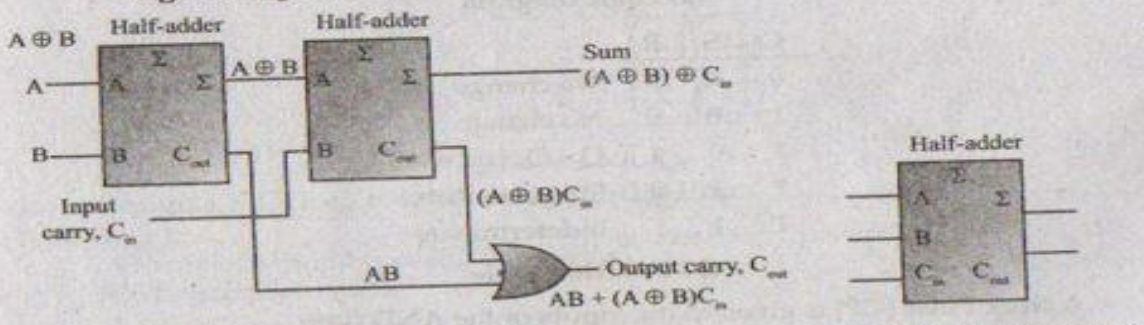
One can see that Sum can also be implemented using XOR gate as $A \oplus B$

Figure :Logic diagram of half adder



A full adder can be constructed from two half adders by connecting A and B to the input of one half adder, connecting the sum from that to an input to the second adder, connecting Ci to the other input and OR the two carry outputs.

Figure: Implementation of Full Adder using two Half Adders.



(a) Arrangement of two half-adders to form a full-adder (b) Full-adder logic symbol

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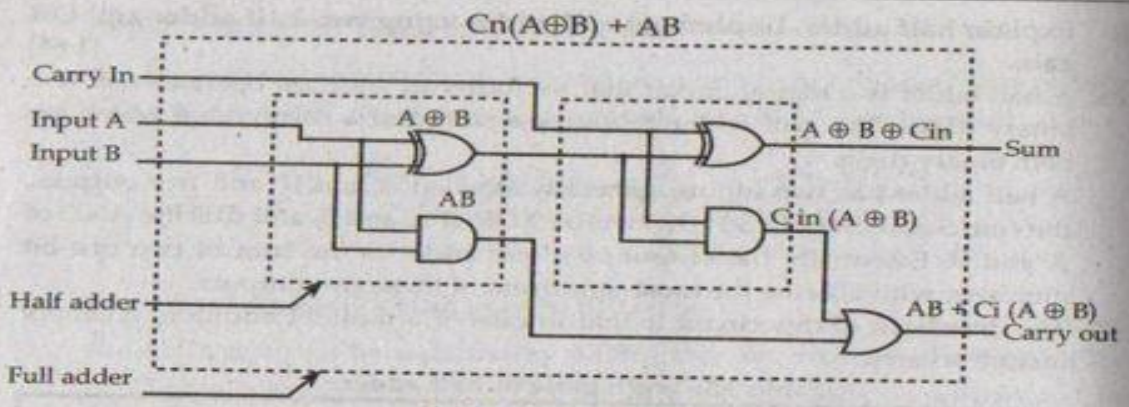


(c)Logic Diagram

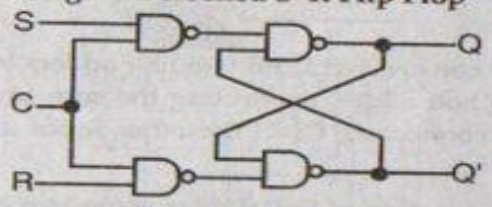
15. Draw a logic diagram, graphical symbol, characteristics table, characteristic equation and excitation table of S.R. flip flop. [1+1+1+1+1]

Ans: **Clocked S–R Flip Flop**

- It is also called a Gated S–R flip flop.
- The problems with S–R flip flops using NOR and NAND gate is the invalid stated.
- This problem can be overcome by using a bitable SR flip-flop that can change outputs when certain invalid states are met, regardless of the condition of either the Set or the Reset inputs.
- For this, a clocked S-R flip flop is designed by adding two AND neither gates to a basic NOR gateflip flop.
- The circuit diagram and truth table is shown below.

The circuit of the S–R flip flop using NAND gated and its truth table is shown below.

Figure : Clocked S–R Flip Flop



(a) Logic diagram

C	S	R	
0	X	X	No change
1	0	0	No change
1	0	1	Q = Q; rest state
1	1	0	Q = 1; set state
1	1	1	Indeterminate

(b) Function table

A clock Pulse [CP] is given to the inputs of the AND Gate.

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When the value of the clock pulse is '0', the outputs of both the AND Fates remain '0'

As soon a pulse is given the value of CP turns '1'.

This makes the values at S and R to pass through the NOR Gate flip flop. But when the values of both S and R values turn '1', the HIGH value of CP causes them to turn to '0' for a short moment.

As soon as the pulse is remove, the flip flop state becomes intermediate.

Thus either of the two states may be caused, and it depends on whether the set or reset input of the flip-flop remains a '1' longer than the transition to '0' at the end of the pulse. Thus the invalid states can be eliminated.

Excitation Table of the SR Latch

During the design process we usually know the transition from present stated to next state and wish to find the latch input conditions that will cause the required transition.

For this reason, we need a table that lists the required inputs for a given change of state. Such a table is called an excitation table, and it specifies the excitation behaviour of the sequential circuits. These are used in the synthesis (design) of sequential circuits, which we shall see latter.

The excitation of the SR latch is as follows:

Excitation Table

Qn	S	R	Q_{n+1}
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	Indeter
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	Indeter

Note: Indeter = not used

K-map for Q_{n+1}

Q_n \ SR	00	01	11	10
0			X	1
1	1		X	1

$$Q_{n+1} = S + \overline{R}.\,Q_n$$

16. Design a MOD – 5 counter using J.K flip flop.

Ans: **Step 1:**

Determine the number of flip flop needed

Flip flop required are 3

Step 2:

Type of flip flop to be used: JK flip flop

Step 3:

Excitation table for counter

Present			Next State			Flip flop input					
Q_C	Q_B	Q_A	Q_{C+1}	Q_{B+2}	Q_{A+1}	J_C	K_C	J_B	K_B	J_A	K_A
0	0	0	0	0	1	×	0	0	×	1	×
0	0	1	0	1	0	×	1	1	×	×	1
0	1	0	0	1	1	×	×	×	0	1	×
0	1	1	1	0	0	×	×	×	1	×	1
1	0	0	0	0	0	1	0	0	×	0	×
1	0	1	×	×	×	×	×	×	×	×	×
1	1	0	×	×	×	×	×	×	×	×	×
1	1	1	×	×	×	×	×	×	×	×	×

Step 4

K-map simplification

For J_CJ_C

Q_C \ Q_BQ_A	00	01	11	10
00	0	0	1	0
01	×	×	×	×

$J_C = Q_BQ_AJ_C = Q_BQ_A$

For K_CK_C

Q_C \ Q_BQ_A	00	01	11	10
00	×	×	×	×
01	1	×	×	×

$K_C = 1K_C = 1$

For JBJB

Q_C \ Q_BQ_A	00	01	11	10
00	1	×	×	0
01	×	×	×	×

$J_B = Q_AJ_B = Q_A$

For KBKB

Q_C \ Q_BQ_A	00	01	11	10
00	×	×	1	0
01	×	×	×	×

$K_B = Q_AK_B = Q_A$

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For JAJA

Q_C \ Q_BQ_A	00	01	11	10
00	1	×	×	1
01	0	×	×	×

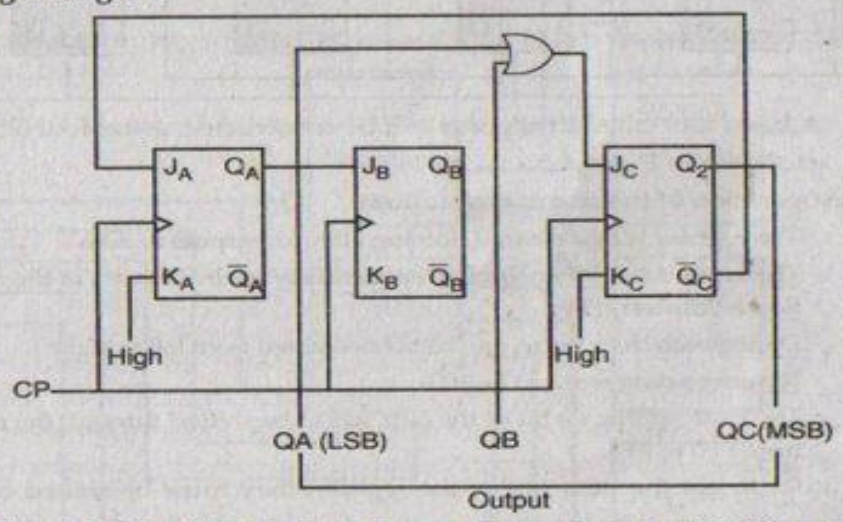
$J_A = \overline{Q}_C J_A = \overline{Q}_C$

For K_AK_A

Q_C \ Q_BQ_A	00	01	11	10
00	×	1	1	×
01	×	×	×	×

$K_A = 1 K_A = 1$

Step 5 Logic Diagram

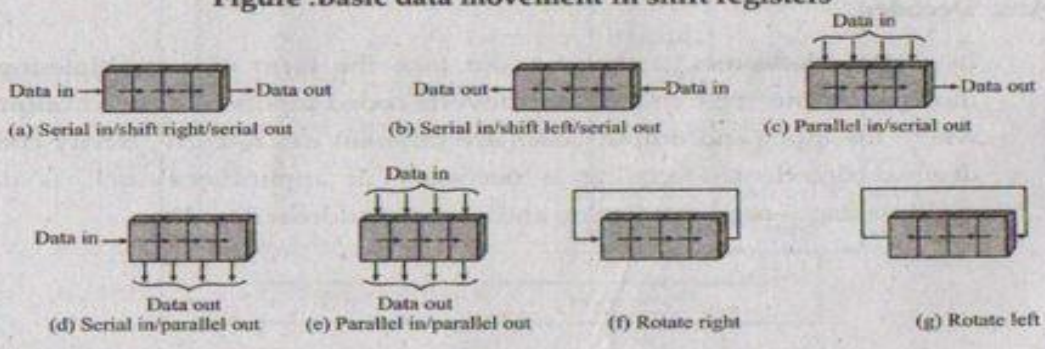


17. Define shift Register. Explain the working principle of SISO register. **[1+4]**

Ans: **Shift Register**

A register that allows each of the flip -flops to pass the stored information to its adjacent neighbor.

Figure :Basic data movement in shift registers



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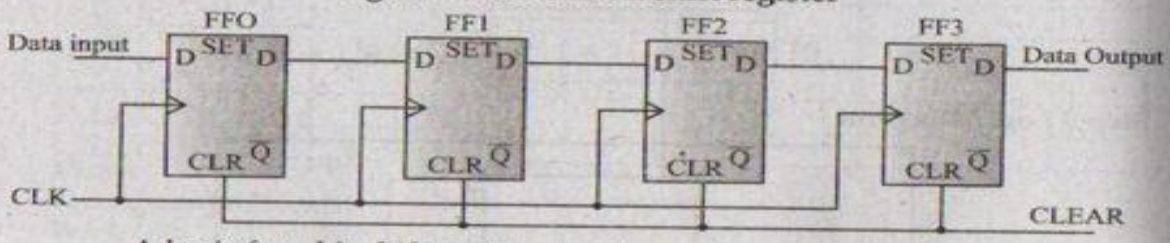
Types of Register

I. Serial In- Serial Out Shift Registers
II. Serial In- Parallel Out Shift Registers
III. Parallel In– Serial Out Shift Register
IV. Parallel In – Parallel Out Shift Register

I. Serial In - Serial Out Shift Registers

The serial in/serial out shift register accepts data serially – that is, one bit at a time on a single line. It produces the stored information on its output also in serial form.

Figure: Basic four-bit shift register



A basic four-bit shift register can be constructed using four D flip -flops, as shown in Figure6.3.

The operation of the circuit is as follows.

- The register is first cleared, forcing all four outputs to zero.
- The input data is then applied sequentially to the D input of the first flip-flop on the left (FF0).
- During each clock pulse, one bit is transmitted from left to right.
- Assume a data word to be 1001.
- The least significant bit of the data has to be shifted through the register from FF0 to FF3.

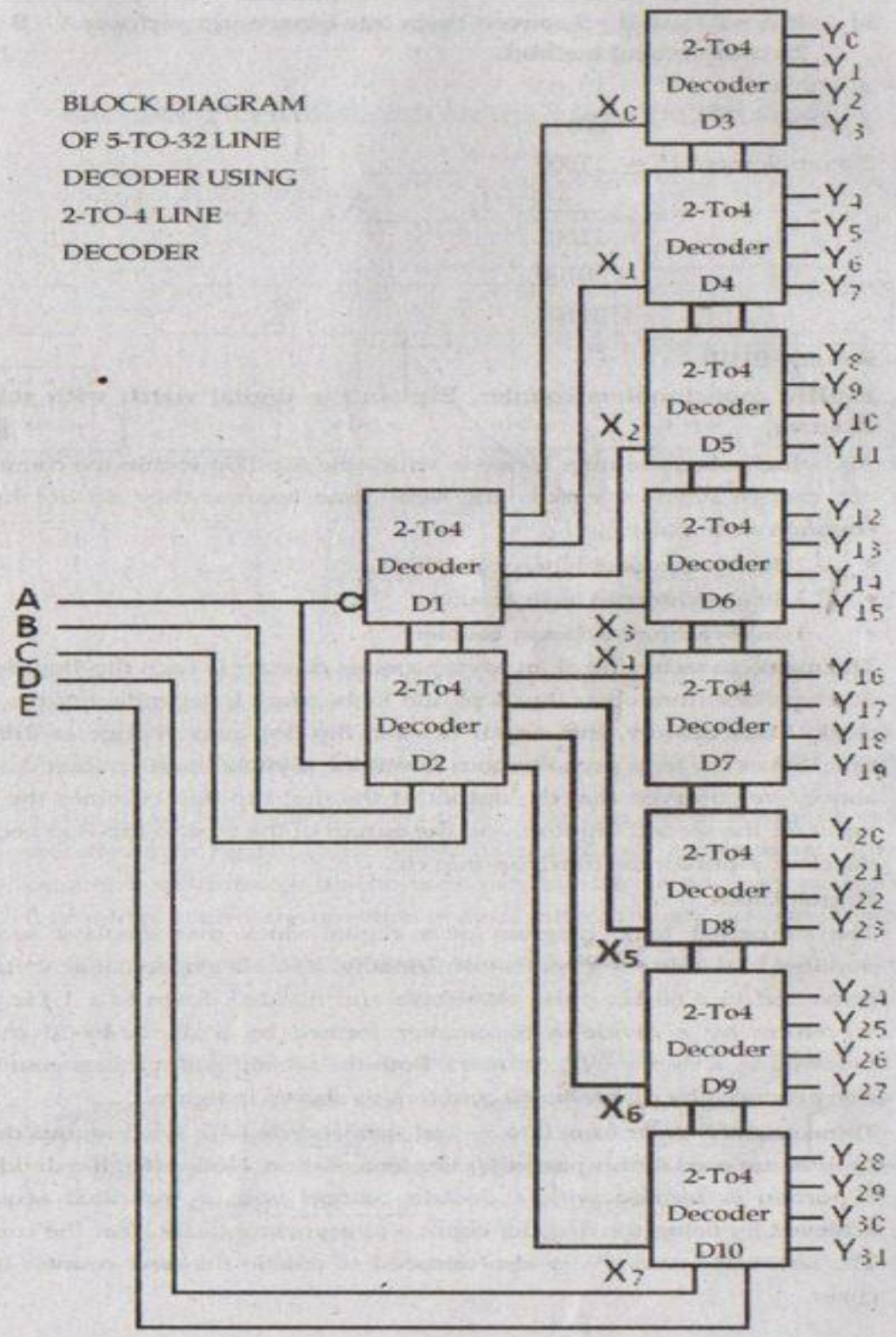
In order to get the data out of the register, they must be shifted out serially. This can be done destructively or non-destructively. For destructive readout, the original data is lost and at the end of the read cycle, all flip-flops are reset to zero.

18. a) What is decoder? Implement 5 × 32 decoder using 2 × 4 decoder. **[1 + 4]**

Ans: **Decoder**

In digital electronics, a decoder can take the form of a multiple-input, multiple-output logic circuit that converts coded inputs into coded outputs, where the input and output codes are different e.g. n-to-2n , binary-coded decimal decoders. Decoding is necessary in applications such as data multiplexing, 7 segment display and memory address decoding

BLOCK DIAGRAM OF 5-TO-32 LINE DECODER USING 2-TO-4 LINE DECODER



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b) If A = 20 and B = 7 convert them into binary and perform A – B using 2's complement method. **[1 + 4]**

Ans: A = 20 = 10100

A_2 = 7 = 00111

2'scomplement 15 = 11000

+1

11001

+ 10100

① 01101

∴ Result = 01101

19. Explain asynchronous counter. Explain the digital watch with suitable diagram. **[2 + 8]**

Ans: An asynchronous counter is one in which the flip-flop within the counter do not change states at exactly the same time because they do not have a common clock pulse.

- 2 Bit asynchronous binary counter
- 3 Bit asynchronous binary counter
- 4 Bit asynchronous binary counter

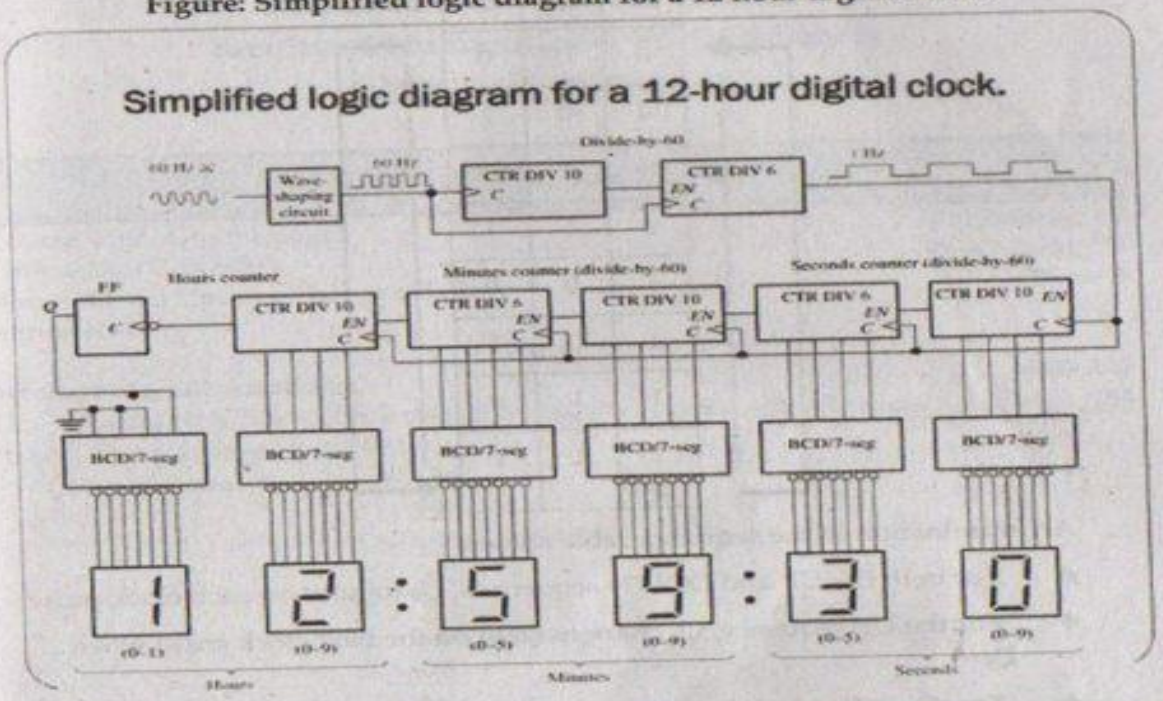
The main characteristic of an asynchronous counter is each flip-flop derives its own clock from other flip-flops and is therefore independent of the input clock. Consequently, the output of each flip-flop may change at different time, hence the term asynchronous. From the asynchronous counter diagram above, we observed that the output of the first flip-flop becomes the clock input for the second flip-flop, and the output of the second flip-flop becomes the clock input for the third flip-flop etc.

Digital Clock

The simplified logic diagram of a digital clock that displays seconds, minutes, and hours is given below. Initially, a 60 Hz sinusoidal ac voltage is converted to a 60 Hz pulse waveform and divided down to a 1 Hz pulse waveform by a divide-by-60 counter formed by a divide-by-10 counter followed by a divide by 6 counters. Both the second and minutes counts are also produced by divide-bu-60 counters, as shown in figure.

These counter count from 0 to 59 and then recycle to 0; synchronous decade counter are used in this particular implementation. Notice that the divide-by-6 portion is formed with a decade counter with a truncated sequence achieved by using the decoder count 6 to asynchronously clear the counter. The terminal count, 59, is also decoded to enable the next counter in the chain.

Figure: Simplified logic diagram for a 12 hour digital clock.

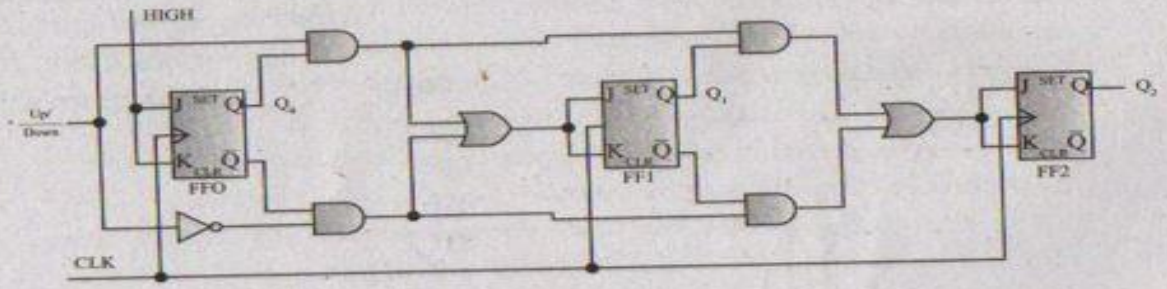


20. Design a 3 bit counter with J.K. flip-flop which counts up when x = 1 and counts down when x = 0. **[10]**

Ans: Up-Down Synchronous Counters

A circuit of a 3-bit synchronous up-down counter and a table of its sequence are shown in figure given below. Similar to an asynchronous up-down counter, a synchronous up-down counter also has an up-down control input. It is used to control the direction of the counter through a certain sequence.

Figure : A basic 3-bit up/down synchronous counter and its up/down sequence



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Up	Q2	Q1	Q0	Down
	0	0	0	
	0	0	1	
	0	1	0	
	0	1	1	
	1	0	0	
	1	0	1	
	1	1	0	
	1	1	1	

An examination of the sequence table shows:

- For both the UP and DOWN sequences, Q_0 toggles on each clock pulse.
- For the UP sequence, Q_1 changes state on the next clock pulse when $Q_0=1$.
- For the DOWN sequence, Q_1 changes state on the next clock pulse when $Q_0=0$.
- For the UP sequence, Q_2 changes state on the next clock pulse when $Q_0=Q_1=1$.
- For the DOWN sequence, Q_2 changes state on the next clock pulse when$Q_0=Q_1=0$.

These characteristics are implemented with the AND, OR & NOT logic connected as shown in the above.

TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

TU QUESTIONS-ANSWERS 2018

Course Title: Digital Logic
Course No: CACS105
Nature of the Course: Theory + Lab
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3

Group 'B'

Attempt any SIX questions. **(6x5=30)**

11. Subtract: 675.6 – 456.4 using both 10's and 9's complement. **[5]**

Ans: Taking Integer part only

A = 675 and B = 456

```
      999
    - 456
      543
      + 1
      544
     +675
Discard→ ①219
```

∴ Result = 219.2

Again,

Taking fraction part only

A = 6 and B = 4

```
      9
    - 4
      5
     +1
      6
     +6
Discard→ ①2
```

Using 9's complement

Taking Integer part only

A = 675 and b = 456

9's complacent = 999

```
    - 456
      543
    + 675
    1 218
      + 1
      219
```

Again Taking Fraction part only

A = 6 and B = 4

9's complement of B = 9

$$\begin{array}{r} -4 \\ \hline 5 \\ +6 \\ \hline 11 \\ +1 \\ \hline 2 \end{array}$$

∴ Result = 219.2

12. What is universal logic gate? Realize NAND and NOR as an universal logic gates. **[1+2+2]**

Ans: University Gates

A universal gate is a gate which can implement any Boolean function without need to use any other gate type. The NAND and NOR gates are universal gates. In practice, this is advantageous since NAND and NOR gates are economical and easier to fabricate and are the basic gates used in all IC digital logic families. In fact, an AND gate is typically implemented as a NAND gate followed by an inverter not the other way around. Likewise, an OR gate is typically implemented as a NOR gate followed by an inverter not the other way around.

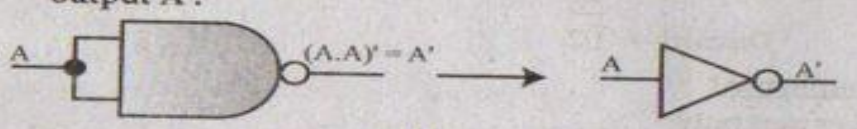
NAND Gate as a Universal Gate

To prove that any Boolean function can be implemented using only NAND gates, we will show that the AND, OR, and NOT operations can be performed using only these gates.

Implementing an Inverter Using only NAND Gate

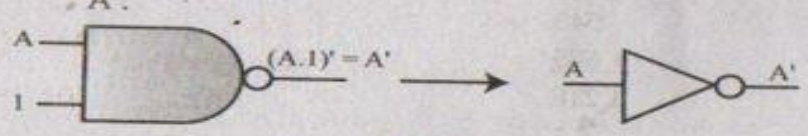
The figure shows two ways in which a NAND gate can be used as an inverter (NOT gate).

1. **All NAND input pins connect to the input signal A gives an output A′.**



(a)

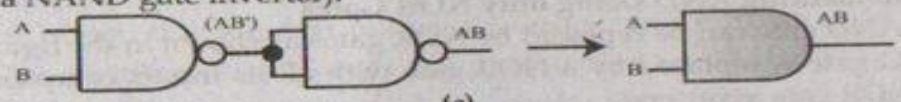
2. One NAND input pin is connected to the input signal A while all other input pins are connected to logic 1. The output will be A′.



(b)

Implementing ANDU sing only NAND Gates

An AND gate can be replaced by NAND gates as shown in the figure (The AND is replaced by a NAND gate with its output complemented bya NAND gate inverter).



(c)

Implementing OR Using only NAND Gates

An OR gate can be replaced by NAND gates as shown in the figure (The OR gate is replaced by a NAND gate with all its inputs complemented by NAND gate inverters).

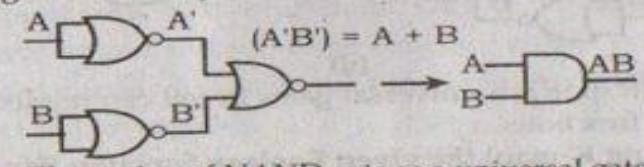


Illustration of NAND gate as a universal gate

(d)

Thus, the NAND gate is a universal gates because it can implement the AND, OR and NOT functions.

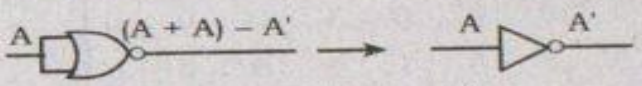
NOR Gate is as Universal Gate

To prove that any Boolean function can be implemented using only NOR gates, we will show that the AND, OR, and NOT operations can be performed using only these gates.

Implementing an Inverter Using only NOR Gate

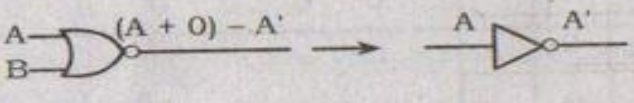
The figure shows two ways in which a NOR gate can be used as an inverter (NOT gate).

1. All NOR input pins connect to the input signal A gives an output A'.



(a)

2. One NOR input pin is connected to the input signal A while all other input pins are connected to logic 0. The output will be A'.



(b)

Implementing OR Using only NOR Gates

An OR gate can be replaced by NOR gates as shown in the figure (The OR is replaced by a NOR gate with its output complemented by a NOR gate inverter)

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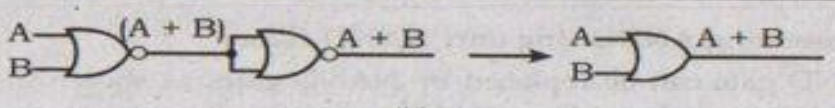
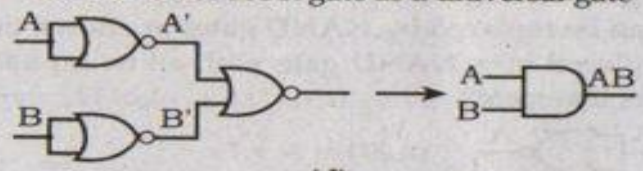


(c)

Implementing AND Using only NOR Gates

An AND gate can be replaced by NOR gates as shown in the figure (The AND gate is replaced by a NOR gate with all its inputs complemented by NOR gate inverters)

Illustration of NOR gate as a universal gate



(d)

Thus, the NOR gate is a universal gates in ceit can implement the AND, OR and NOT functions.

13. Simplify (using K-map) the given Boolean function F in both SOP and POS using don't care conditions A:

F = B'C'D' + BCD' + ABCD' + B'CD' + A'BC'D **[2+3]**

Ans: F = B'C'D' + BCD' + ABCD' + B'CD' + A'BC'D

In SOP

AB \ CD	00	01	11	10
00	D	0	1	1
01	×		1	1
11		1		1
10	1			1

F = CD'+ B'D' + ABC'D

In POS

AB \ CD	00	01	11	10
00		0	0	
01	0	0	0	
11	0		0	
10		0	0	

$F = (\bar{C} + \bar{D}).(A + \bar{D}).(B + \bar{D}).(\bar{B} + C + D)$

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14. Define encoder: Draw logic diagram and truth table of octal-to-binary encoder. [1+4]

Ans: **Encoder**

An encoder is a device, circuit, transducer, software program, algorithm or person that converts information from one format or code to another. The purpose of encoder is standardization, speed, secrecy, security, or saving space by shrinking size. Encoders are combinational logic circuits and they are exactly opposite of decoders. They accept one or more inputs and generate a multibit output code.

Encoders perform exactly reverse operation than decoder. An encoder has M input and N output lines. Out of M input lines only one is activated at a time and produces equivalent code on output N lines. If a device output code has fewer bits than the input code has, the device is usually called an encoder.

I. Octal to binary encoder

Octal-to-Binary take 8 inputs and provides 3 outputs, thus doing the opposite of what the 3-to-8 decoder does. At any one time, only one input line has a value of 1. The figure below shows the truth table of an Octal-to-binary encoder.

Table: Truth Table of octal to binary encoder

I0	I1	I2	I3	I4	I5	I6	I7	Y2	Y1	Y0
1	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	1	0	0	0	1	0	0
0	0	0	0	0	1	0	0	1	0	1
0	0	0	0	0	0	1	0	1	1	0
0	0	0	0	0	0	0	1	1	1	1

For an 8-to-3 binary encoder with inputs I_0-I_7 the logic expressions of the outputs Y_0-Y_2 are:

$Y_0 = I_1 + I_3 + I_5 + I_7$

$Y_1 = I_2 + I_3 + I_6 + I_7$

$Y_2 = I_4 + I_5 + I_6 + I_7$

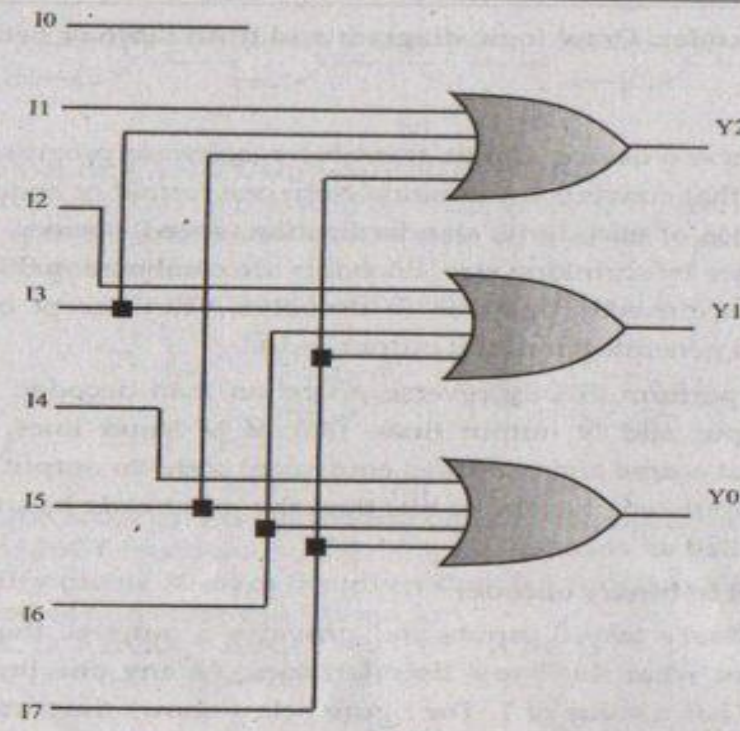


Figure: Logic Diagram of octal to binary encoder

15. What is D flip-flop? Explain clocked RS flip flop with its logic diagram and truth table. [1+4]

Ans: **D Flip Flop**

D flip is actually a slight modification of the above explained clocked SR flip-flop. From the figure you can see that the D input is connected to the S input and the complement of the D input is connected to the R input.

The D input is passed on to the flip flop when the value of CP is '1'

When CP is HIGH, the flip flop moves to the SET state. If it is '0', the flip flop switches to the CLEAAR state.

As long as the clock input C = 0, the SR latch has both inputs equal to 0 and it can't change its state regardless of the value of D.

When C is 1, the latch is placed in the set or reset state based on the value of D.

If D = 1, the Q output goes to 1.

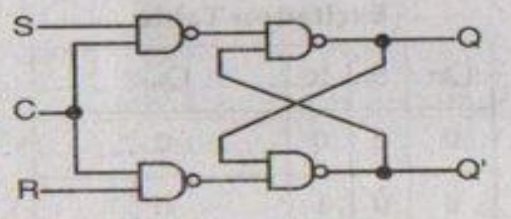
If D = 0, the Q output goes to 0.

Clocked S–R Flip Flop

- It is also called a Gated S–R flip flop.
- The problems with S–R flip flops using NOR and NAND gate is the invalid stated.

- This problem can be overcome by using a bitable SR flip-flop that can change outputs when certain invalid states are met, regardless of the condition of either the Set or the Reset inputs.
- For this, a clocked S-R flip flop is designed by adding two AND neither gates to a basic NOR gateflip flop.
- The circuit diagram and truth table is shown below.

The circuit of the S–R flip flop using NAND gated and its truth table is shown below.



(a) Logic diagram

C	S	R	
0	X	X	No change
1	0	0	No change
1	0	1	Q = Q; rest state
1	1	0	Q = 1; set state
1	1	1	Indeterminate

(b) Function table

Figure: Clocked S–R Flip Flop

A clock Pulse [CP] is given to the inputs of the AND Gate.

When the value of the clock pulse is '0', the outputs of both the AND Fates remain '0'

As soon a pulse is given the value of CP turns '1'.

This makes the values at S and R to pass through the NOR Gate flip flop. But when the values of both S and R values turn '1', the HIGH value of CP causes them to turn to '0' for a short moment.

As soon as the pulse is remove, the flip flop state becomes intermediate.

Thus either of the two states may be caused, and it depends on whether the set or reset input of the flip-flop remains a '1' longer than the transition to '0' at the end of the pulse. Thus the invalid states can be eliminated.

Excitation Table of the SR Latch

During the design process we usually know the transition from present stated to next state and wish to find the latch input conditions that will cause the required transition.

For this reason, we need a table that lists the required inputs for a given change of state. Such a table is called an excitation table, and it specifies the excitation behaviour of the sequential circuits. These are used in the synthesis (design) of sequential circuits, which we shall see latter.

The excitation of the SR latch is as follows:

Excitation Table

Qn	S	R	Q_{n+1}
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	Indeterminate
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	Indeterminate

Note: Indeterminate = not used

K-map for Q_{n+1}

Q_n \ SR	00	01	11	10
0			X	1
1	1		X	1

$$Q_{n+1} = S + \overline{R}.\,Q_n$$

16. Design MOD-5 counter with state and timing diagram. **[2+1+2]**

Ans: **Step 1:**

Determine the number of flip flop needed

Flip flop required are 3

Step 2:

Type of flip flop to be used: JK flip flop

Step 3:

Excitation table for counter

Present state			Next state			Flip flop Input					
Q_C	Q_B	Q_A	Q_{C+1}	Q_{B+1}	Q_{A+1}	J_C	K_C	J_B	K_B	J_A	K_A
0	0	0	0	0	1	×	0	0	×	1	×
0	0	1	0	1	0	×	1	1	×	×	1
0	1	0	0	1	1	×	×	×	0	1	×
0	1	1	1	0	0	×	×	×	1	×	1
1	0	0	0	0	0	1	0	0	×	0	×
1	0	1	×	×	×	×	×	×	×	×	×
1	1	0	×	×	×	×	×	×	×	×	×
1	1	1	×	×	×	×	×	×	×	×	×

Step 4

K-map simplification

For J_C

Q_C \ Q_BQ_A	00	01	11	10
0	0	0	1	0
1	×	×	×	×

$J_C = Q_B Q_A$

For K_C

Q_C \ Q_BQ_A	00	01	11	10
0	×	×	×	×
1	1	×	×	×

$K_C = 1$

For J_B

Q_C \ Q_BQ_A	00	01	11	10
0	1	×	×	×
1	×	×	×	×

$J_B = Q_A$

For K_B

Q_C \ Q_BQ_A	00	01	11	10
0	×	×	1	×
1	×	×	×	×

$K_B = Q_A$

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For J_A

Q_C \ Q_BQ_A	00	01	11	10
0	1	×	×	1
1	0	×	×	×

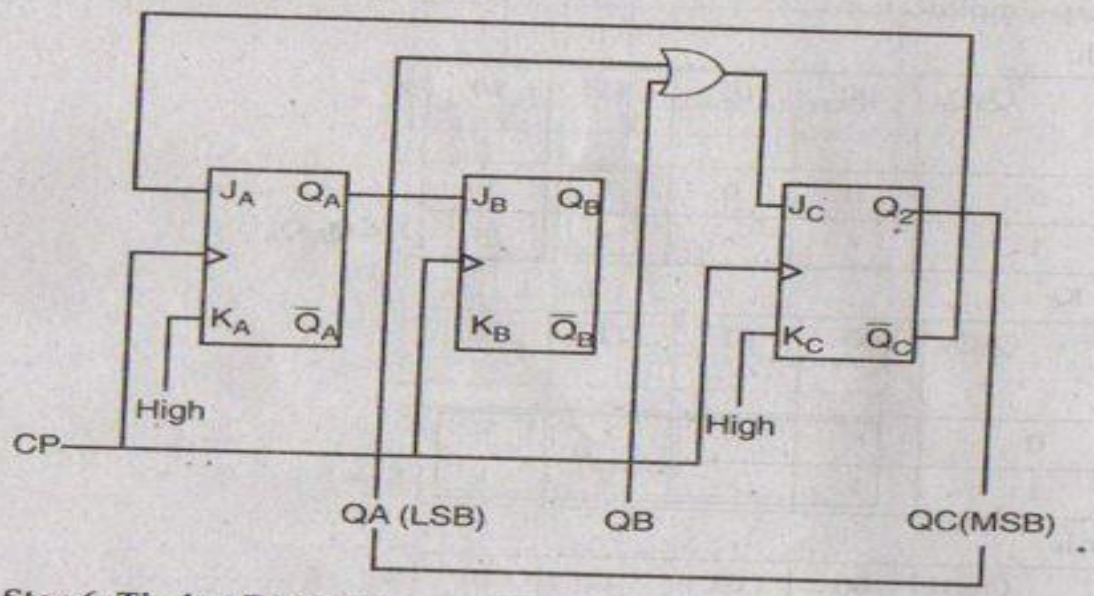
$J_A = Q'C$

For K_A

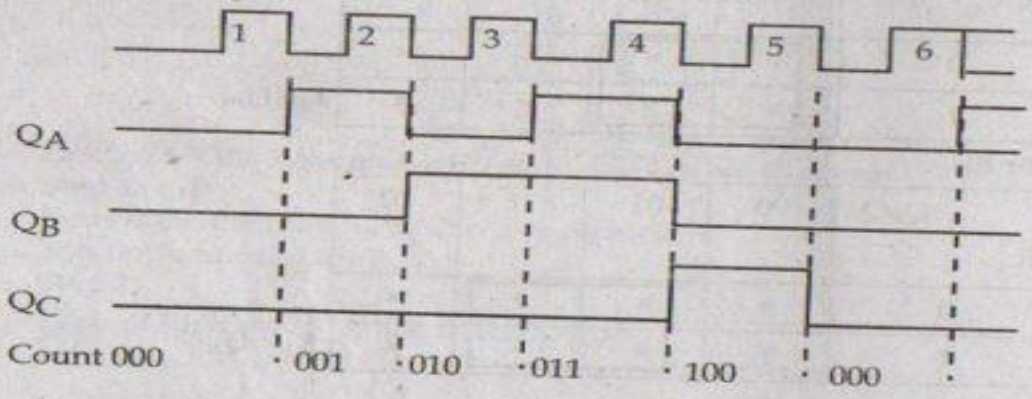
Q_C \ Q_BQ_A	00	01	11	10
0	×	1	1	×
1	×	×	×	×

$K_A = 1$

Step 5 Logic Diagram



Step 6: Timing Diagram



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17. Design a 4-bit serial into parallel-out shift register with timing diagram. [3+2]

Ans: **Serial In - Parallel Out Shift Registers**

In serial In-Parallel out shift register, data input is done serially from one of the left most/right most flip-flop. But data output is done simultaneously though all the flip-flop in a single clock pulse. In SIPO shift register, if n bit data is to input (load) and to receive all bits at the output we will require 'n + 1' clock pulse.

Figure below illustrate the logic diagram of a serial in shift right parallel out shift register where serial data input is provided through the D_0 input line of FF_0 and the parallel output is transferred through the Q_0, Q_1, Q_2, Q_3 output lines of the flip-flops. FF_0, FF_1, FF_2 and FF_3 respectively. We should note that the output lines of the respective flip-flop will be enabled only when the register is completely loaded i.e. after the register is loaded in a next clock pulse the content of a register are transferred simultaneously and the register will be cleared in a single clock pulse. A construction of a four-bit serial in - parallel out register is shown below.

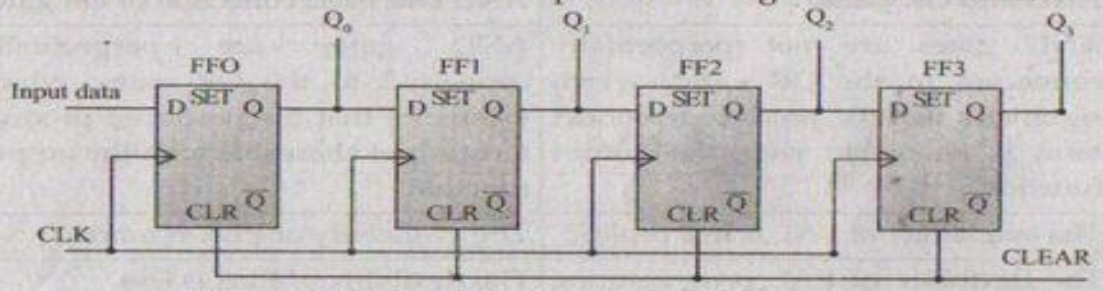

Figure: A 4-bit serial in/parallel out shift registers

In the table below, we can see how the four-bit binary number 1001 is shifted to the Q outputs of the register.

Table: Shift operation in serial in parallel out shift register

Clear	FF0	FF1	FF2	FF3
1001	0	0	0	0
	1	0	0	0
	0	1	0	0
	0	0	1	0
	1	0	0	1

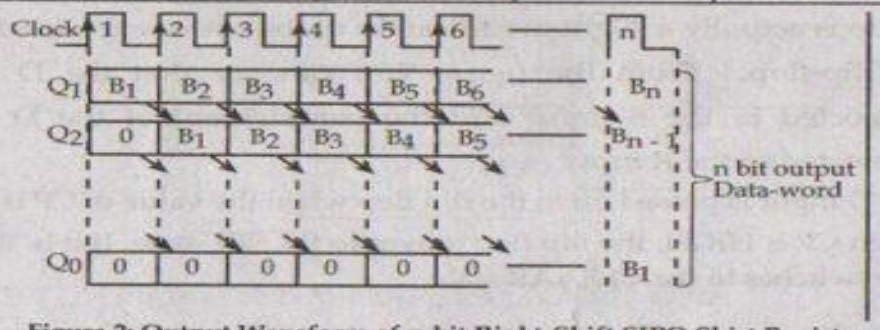

Figure 2: Output Waveform of n-bit Right-Shift SIPO Shirt Register

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Group "C"

Attempt any TWO questions. **[2×10=20]**

18. Write difference between PLA and PAL. Design a PLA circuit with given functions.

F1 (A, B, C) = Σ(2, 3, 5)

F2 (A, B, C) = Σ(0, 4, 5, 7). Design PLA program table also. **[3+7]**

Ans:

Difference between PAL and PLA

ProgrammableLogic Array (PLA)	Programmable Array Logic (PAL)
The full form of PAL is programmable logic array	Thefull form of the PLA is a programmable array logic
Theconstruction ofPAL can be done using the programmable collection of AND and OR Gates	The construction of PLA can be done using the programmable collection of AND and fixed collection of OR gates
AND gates are not perpectually connected to the OR gates, which significies that the produced product term is shareable with the output function.	AND gates are perpectually connected to the OR gates, which significies that the produced product term is not shareable with the output function.
The availablity of PAL is less prolific	The availablity of PLA is more
The flexibility of PAL programming is more	The flexibility of PLA is less
The cost of PAL is expensive	Thecost ofPLA is middle range
The number of functions implemented in PAL is large	The number of functions implemented in PLA is limited
The speed of PAL is slow	The spped ofPLA is high

19. Define D flip flop. Design a Master-slave flip-flop by using JK flip-flop along with its circuit diagram and truth table. **[2+8]**

Ans: **D Flip Flop**

D flip is actually a slight modification of the above explained clocked SR flip-flop. From the figure you can see that the D input is connected to the S input and the complement of the D input is connected to the R input.

The D input is passed on to the flip flop when the value of CP is '1'

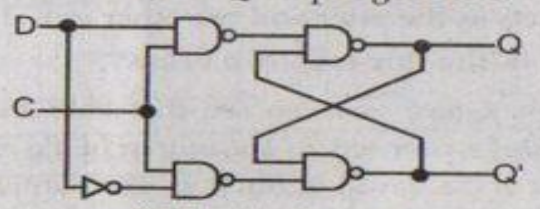
When CP is HIGH, the flip flop moves to the SET state. If it is '0', the flip flop switches to the CLEAAR state.

As long as the clock input C = 0, the SR latch has both inputs equal to 0 and it can't change its state regardless of the value of D.

When C is 1, the latch is placed in the set or reset state based on the value of D.

If D = 1, the Q output goes to 1.

If D = 0, the Q output goes to 0.



(a) Logic diagram

C	D	Next state of Q
0	X	No change
1	0	Q = 0: Rest state
1	1	Q = 1: Set state

(b) Function table

Excitation Table

Q_n	D	Q_{n+1}
0	0	0
0	1	1
1	0	0
1	1	1

K-map for Q_{n+1}

Q_n \ D	0	1
0		1
1		1

$Q_{n+1} = D$

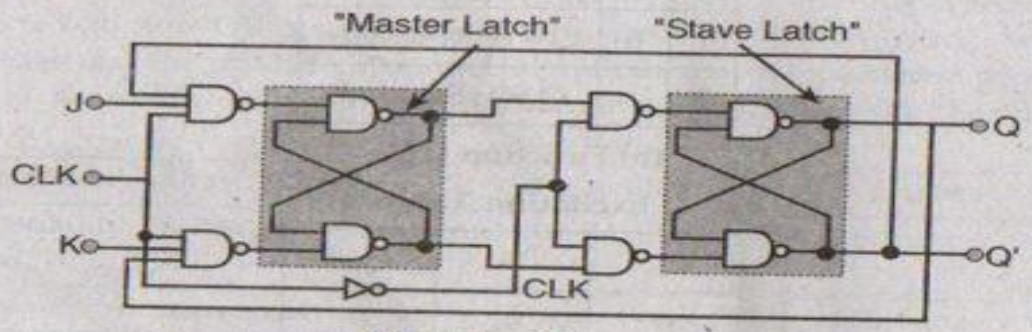
Figure: D Flip Flop using NAND Gate

Master–Slave Flip Flop Circuit

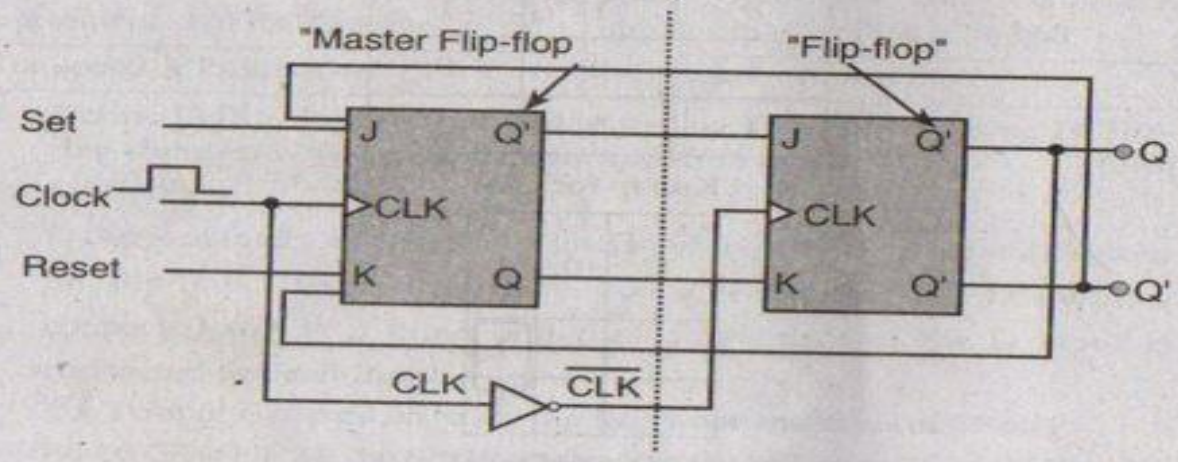
Before knowing more about the master–slave flip flop you have to know more on the basics of a J–K flip flop and S–R flip flop/. To know more about the flip flops, click on the link below.

Master–slave flip flop is designed using two separate flip flops. Out of these, one acts as the aster and the other as a slave. The figure of a master–slave J–K flip flop is shown below.

From the below figure you can see that both the J–k flip flops are presented in a series connection. The output of the master J–K flip flop is fed to the input of the slave J–K flip flop. The output of the slave J–k flip flop is given as a feedback to the input of the master J–K flip flop. The clock pulse [CLK] is given to the master J–K flip flop and it is sent through a NOT Gate and thus inverted before passing it to the slave J–K flip flop.



(a) Logic diagram



(b) Block diagram

Figure: Master-Slave Flip-flop

Working

When Clock = 1, the master J–K flip flop gets disabled. The clock input of the master input will be the opposite of the slave input. So the master flip flop output will be recognized by the slave flip flop only when the clock value becomes0. Thus, when the clock pulse males a transition from 1 to 0, the locked outputs of the master flip flop are fed through to the inputs of the slave flip–flop making this flip flop edge or pulse–triggered. To understand better take a look at the timing diagram illustrated below.

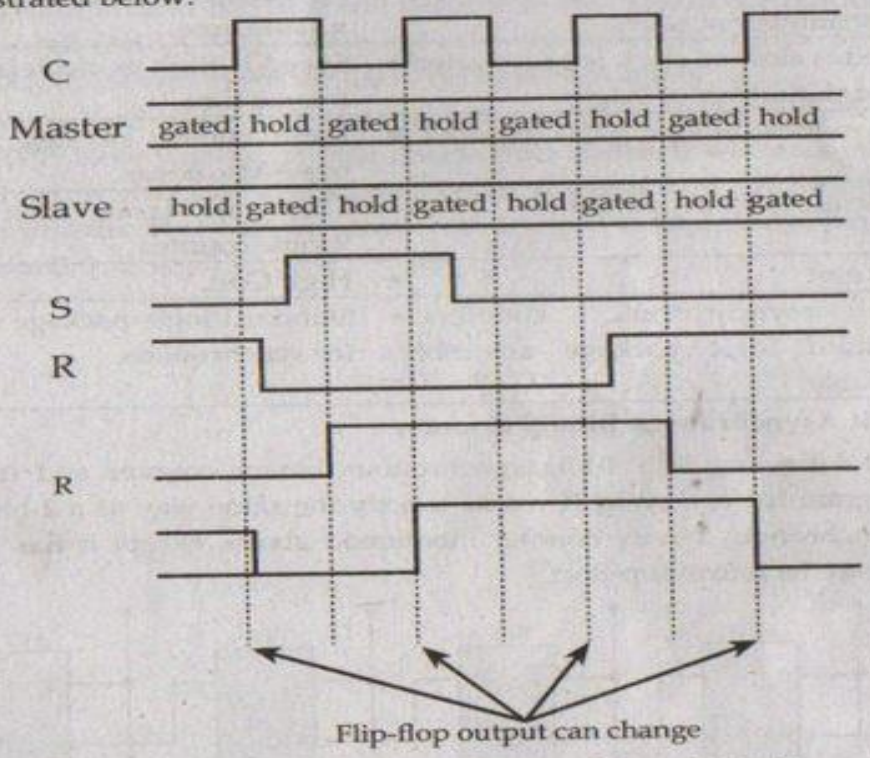


Figure: Timing Diagram of Master-Slave Flip-Flop

Thus, the circuit accepts the value in the input when the clock is HIGH, and passes the data to the output on the falling–edge of the clock signal. This makes the Master–Slave J–k flip flop a Synchronous device as it only passes data with the timing of the clock signal.

20. Write down the difference between asynchronous and synchrounous counter. Design a 4-bit binary ripple counter along with its circuit, state and timing diagram. [1+7]

Ans: The following table shows the difference between the Asynchronous and Synchronous Counter:

Table: Difference between Synchronous and Asynchronous Counter

Asynchronous/Ripple Counter	Synchronous Counter
• Flip flop are connected in such a way that the output of first flip flop driver the clock of next flip flop.	• There is no connection between output of the first flip flop and clock of next flip-flop.
• Flip flop are not clocked simultaneously.	• All Flip flop are clocked simultaneously.
• Logic Circuit is very simple even for more number of states	• Speed is high as clock is given at a same time.
• Speed is slow as clock is propagated through number of stages.	• Speed is high as clock is given at a same time.
• Less number of logic gates required.	• Large number of logic gates are required to design.
• These are slow in operation.	• These are faster than that of Ripple counter
• Low cost	• High Cost.
• For asynchronous counters, Standard logic package are not available.	• Standard logic package available for synchronous.

4 Bit Asynchronous Binary Counter

The following is a 4-bit asynchronous binary counter and its timing diagram for one cycle. It works exactly the same way as a 2-bit or 3 bit asynchronous binary counter mentioned above, except it has 16 states due to the fourth flip-flop.

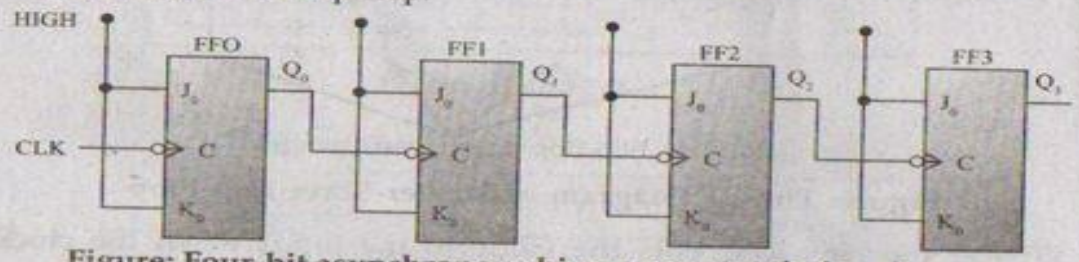
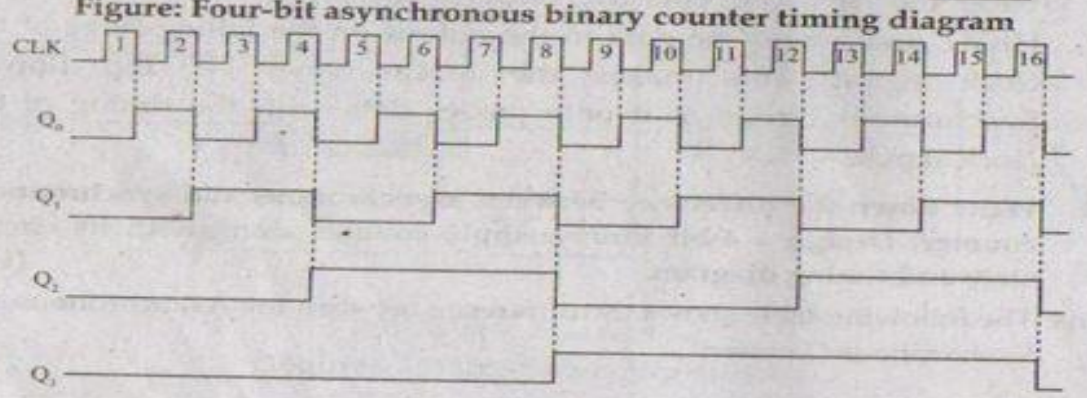


Figure: Four-bit asynchronous binary counter timing diagram



Working of asynchronous up counter is explained below,

Let us assume that the 4 Q outputs of the flip flops are initially 0000. When the rising edge of the clock pulse is applied to the FF0, then the output Q0 will change to logic 1 and the next clock pulse will change the Q0 output to logic 0. This means the output state of the clock pulse toggles (changes from 0 to1) for one cycle.

As the Q′ of FF0 is connected to the clock input of FF_1, then the clock input of second flip flop will become 1. This makes the output of FF_1 to be high (i.e. $Q_1 = 1$), which indicates the value 20. In this way the next clock pulse will make the Q0 to become high again.

So now both Q_0 and Q_1 are high, this results in making the 4 bit output 11002. Now if we apply the fourth clock pulse, it will make the Q_0 and Q_1 to low state and toggles the FF_2. So the output Q_2 will become 0010¬2. As this circuit is 4 bit up counter, the output is sequence of binary values from 0, 1, 2, 3....15

❑❑❑

TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

TU QUESTIONS-ANSWERS 2019

Course Title: Digital Logic
Course No: CACS105
Nature of the Course: Theory + Lab
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3

Group 'B'

Attempt any SIX questions. **(6x5=30)**

11. Subtract 1010.101-101.101 using both 2's and 1's complement. **[5]**

Ans: Using 2's complement

Here, at first taking integer part only

A = 1010 and B = 101

2's comp. of B = 0101
+ 1
1010

Now

A : 1010
2's Complement of B : + 1010
①0101

Again, taking fraction part only

A = 110 and B = 101

2's comp of B = 011

Now,

A = 110
2's comp B: 011
①001
Discard

∴ Result = $(101.001)_2$

Using 1's complement:

At hot taking integer part only.

A =- 1010 and B = 0101

1's complement of B = 1010
+ A = 1010
1 10100
+1
001

∴ Result = $(101.001)_2$

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12. Simplify (Using k-map) the given Boalean function in both SOP and POS using the don't care condition d.

Ans: Given function are:

$F(A, B, C, D) = \pi(0, 1, 3, 7, 8, 12)$ and $\pi(d)(5, 10, 13, A)$

For POS:

AB \ CD	00	01	11	10
00	0	0	0	
01		×	×	×
11	0	×		×
10	0			×

$\therefore \quad F = (\overline{A} + D) . (A + \overline{D}) . (A + B + C)$

For SOP:

AB \ CD	00	01	11	10
00				1
01	1	×	×	1
11		×	1	×
10		1	1	×

$F = C\overline{D} + AD + \overline{A}B\overline{C}$

13. Define decoder. Draw logic diagram and truth table of 3 to 8 decoder. [1 + 4]

Ans: **Decoder**

In digital electronics, a decoder can take the form of a multiple-input, multiple-output logic circuit that converts coded inputs into coded outputs, where the input and output codes are different e.g. n-to-2n , binary-coded decimal decoders. Decoding is necessary in applications such as data multiplexing, 7 segment display and memory address decoding.

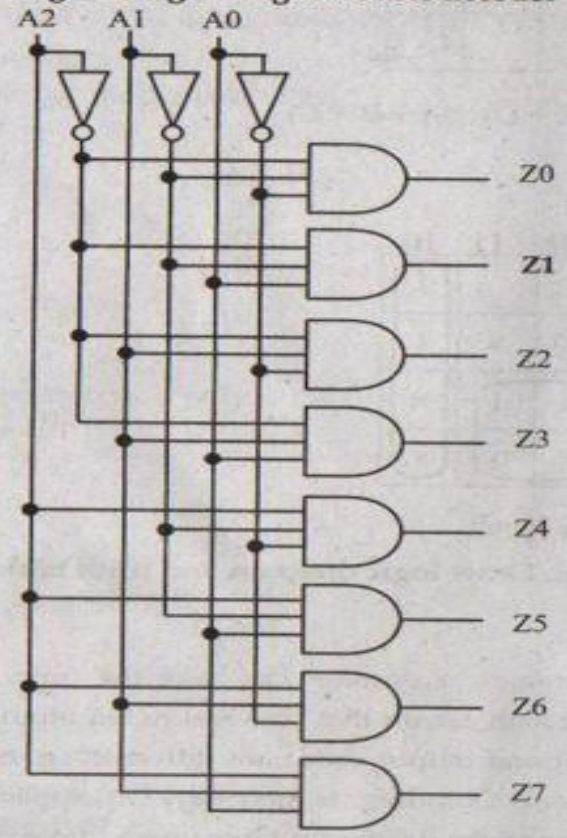
3:8 decoder

It uses all AND gates, and therefore, the outputs are active- high. For active-low outputs, NAND gates are used. It has 3 input lines and 8 output lines. It is also called as binary to octal decoder it takes a 3-bit binary input code and activates one of the 8(octal) outputs corresponding to that code. The truth table is as follows:

Table :Truth Table of 3:8 decoder

A_2	A_1	A_0	Z_7	Z_6	Z_4	Z_4	Z_3	Z_2	Z_1	Z_0
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	1	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

Figure: Logic Diagram of 3:8 decoder

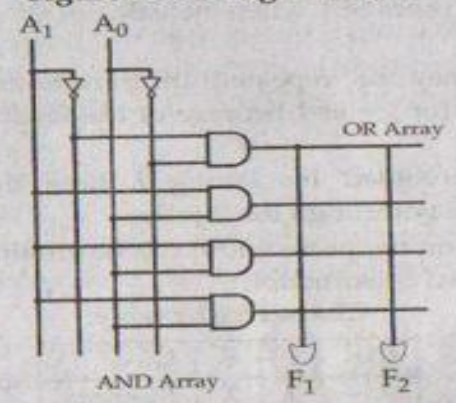


14. Define ROM. Implement the following combinational logic function using ROM. [2 + 3]

A1	A0	F1	F2
0	0	1	0
0	1	0	1
1	0	1	10
1	1	1	

Ans: **Read-only memory (ROM)** is a type of non-volatile memory used in computers and other electronic devices. Data stored in ROM cannot be electronically modified after the manufacture of the memory device. Read-only memory is useful for storing software that is rarely changed during the life of the system, sometimes known as firmware. Software applications for programmable devices can be distributed as plug-in cartridges containing read-only memory.

Figure: ROM Logic Circuit



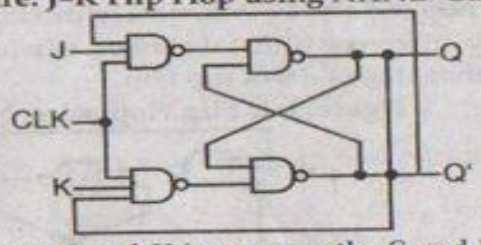
15. What are the drawback of clocked RS flip flop? Explain the operation of JK Flip flop along with its circuit diagram and characteristic table. [3 + 3]

Ans: The one major **disadvantage** of the **s-r flip flop** is that in the condition when the clock is triggered the inputs become high which is an undesirable condition because it causes invalid input ,the condition in which you can't predict the output.

J–K FLIP Flop

- a J–K flip flop can also be defined as a modification of the S–R flip flop. The only difference is that the intermediate state is more refined and precise than that of a S–R flip flop.

Figure: J–K Flip Flop using NAND Gate



- The behavior of inputs J and K is same as the S and R inputs of the S–R flip flop. The letter j stands for SET and the letter K stands for CLEAR.
- When both the inputs J and K have a HIGH state, the flip-flop switches to the complement state. So, for a value of Q = 1, it switches to Q= 0 and for a value for Q = 0, it switches to Q = 1.

- The circuit includes two 3-input AND gates. The output Q of the flip flop is returned back as a feedback to the input of the AND along with other inputs like K and clock pulse [CP].
- So, if the value of CP is '1' the flip flop gets a CLEVER signal and with the condition that the value of Q was earlier 1.
- Similarly output Q' of the flip flop is given as a feedback to the input of the AND along with other inputs like J and clock pulse [CP].
- So the output becomes ET when the value o CP is 1 only if the value of Q' was earlier 1.
- The output becomes SET when the value of CP is 1 only if the value of Q' was earlier 1.
- The output may be repeated in transitions once they have been complimented for J = k=1 because of the feedback connection in the JK flip-flop.
- This can be avoided by setting a time duration lesser than the propagation delay through the flip-flop.
- The restriction on the pulse width can be eliminated with a master-slave or edge-triggered construction

Characteristic table:

CIK	J	K	Q_{n+1}
0	X	X	Memory
1	0	0	Memory
1	0	1	0
1	1	0	1 (Set)
1	1	1	Toggle

16. What is T flip-flop? Explain clocked JK flip-flop with its logic diagram and truth table. **[1 + 4]**

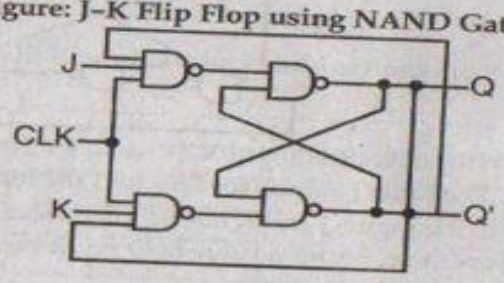
Ans: **T Flip Flop**

This is a much simple version of the J–K flip flop. Here, both the J and K inputs are connected together and thus are also called a single input J–k flip flop.When clock pulse is given to the flip flop, the output begins to toggle.

J–K FLIP Flop

- a J–K flip flop can also be defined as a modification of the S–R flip flop. The only difference is that the intermediate state is more refined and precise than that of a S–R flip flop.

Figure: J–K Flip Flop using NAND Gate



- The behavior of inputs J and K is same as the S and R inputs of the S–R flip flop. The letter j stands for SET and the letter K stands for CLEAR.
- When both the inputs J and K have a HIGH state, the flip-flop switches to the complement state. So, for a value of Q = 1, it switches to Q= 0 and for a value for Q = 0, it switches to Q = 1.
- The circuit includes two 3-input AND gates. The output Q of the flip flop is returned back as a feedback to the input of the AND along with other inputs like K and clock pulse [CP].
- So, if the value of CP is '1' the flip flop gets a CLEVER signal and with the condition that the value of Q was earlier 1.
- Similarly output Q' of the flip flop is given as a feedback to the input of the AND along with other inputs like J and clock pulse [CP].
- So the output becomes ET when the value o CP is 1 only if the value of Q' was earlier 1.
- The output becomes SET when the value of CP is 1 only if the value of Q' was earlier 1.
- The output may be repeated in transitions once they have been complimented for J = k=1 because of the feedback connection in the JK flip-flop.
- This can be avoided by setting a time duration lesser than the propagation delay through the flip-flop.
- The restriction on the pulse width can be eliminated with a master-slave or edge-triggered construction

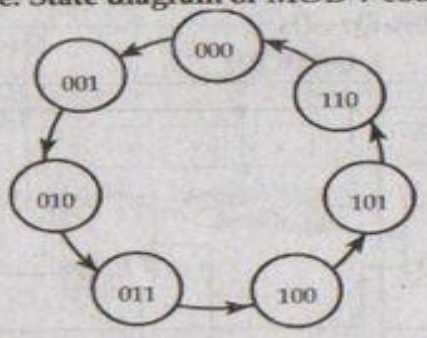
Characteristic table:

ClK	J	K	Q_{n+1}
0	X	X	Memory
1	0	0	Memory
1	0	1	0
1	1	0	1 (Set)
1	1	1	Toggle

17. Design MOD-7 counter with state and timing diagram. **[2 + 1 + 2]**

And:

Figure: State diagram of MOD-7 counter.



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Now derive the excitation table from the state. Tables which is shown in table given below:

Figure Excitation Table

Output State transitions						Flip-flop inputs		
Present State			Next state					
S_2	S_1	S_0	S_2	S_1	S_0	T_1	T_2	T_3
0	0	0	0	0	1	0	0	1
0	0	1	0	1	0	0	1	1
0	1	0	0	1	1	0	0	1
0	1	1	1	0	0	1	1	1
1	0	0	1	0	1	0	0	1
1	0	1	1	1	0	0	1	1
1	1	0	0	0	0	1	1	0

k-map Simplification

Fro T_2:

For T_2:

Q_2 \ Q_1Q_0	00	01	11	10
00			1	
01			×	1

$T_2 = Q_1Q_0 + Q_2 + Q_1$

For T_1:

Q_2 \ Q_1Q_0	00	01	11	10
00		1	1	
01		×	×	1

$T_1 = Q_0 + Q_2 + Q_1$

For T_0

Q_2 \ Q_1Q_0	00	01	11	10
00	1	1	1	1
01	1	1	×	0

$T_0 = \overline{Q}_2 + \overline{Q}_2$

Figure: MOD-7 Synchronous counter

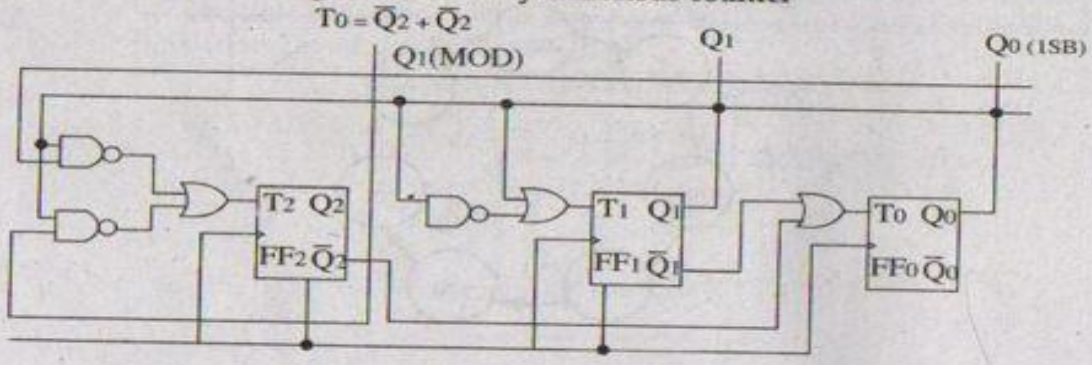

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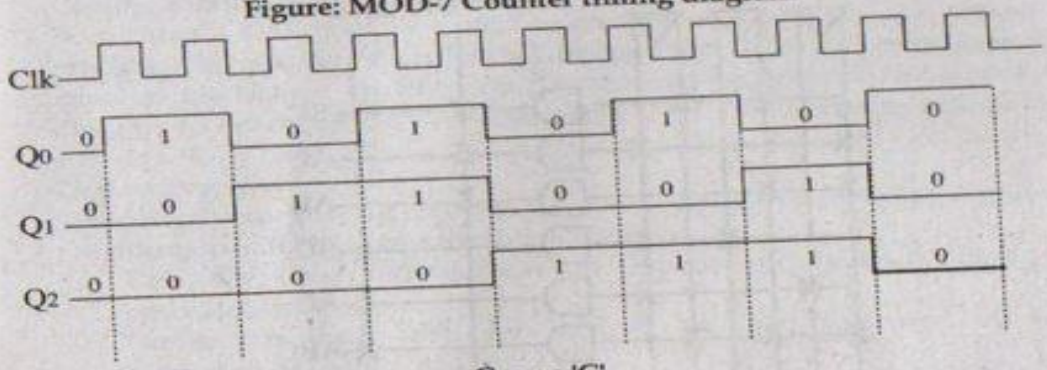
Figure: MOD-7 Counter timing diagram



Group 'C'

Attempt any TWO questions. [12 × 10 = 20]

18. Define PLA. Design a PLA circuit with given function.

F1(A, B, C) = Σ(3, 5, 6, 7)

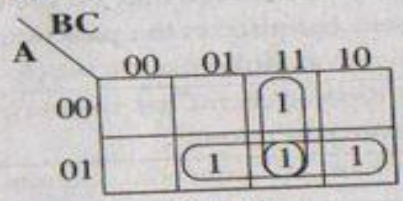
F2 (A, B, C) = Σ(0, 2, 4, 7). Design PLA program table also

Ans: F1(A, B, C) = Σ(3, 5, 6, 7)

F2 (A, B, C) = Σ(0, 2, 4, 7)

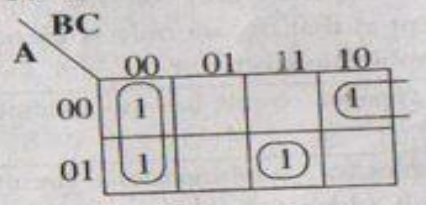
K-map Simplification

For F_1:



$F_1 = BC + AC + AB$

For F_2

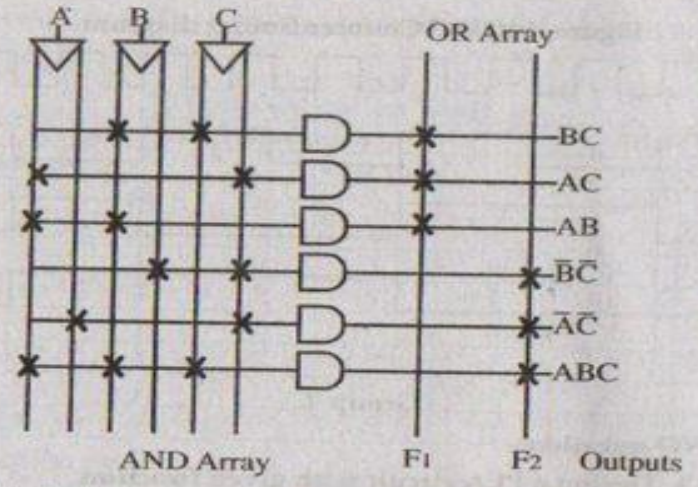


$F_1 = \overline{B}\overline{C} + \overline{A}\overline{C} + ABC$

Figure: Function table hr production terms.

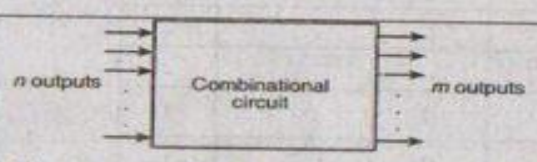
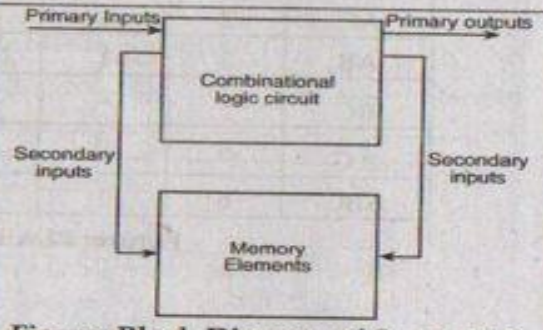
Product Terms		Inputs			Outputs	
BC	1	–	1	1	1	-
AC	2	1	–	1	1	-
AB	3	1	1	–	1	-
$\overline{B}\overline{C}$	4	–	0	0	-	1
$\overline{A}\overline{C}$	5	0	–	0	-	1
ABC	6	1	1	1	-	1

Figure: PLA Logic Diagram



19. Distinguish between sequential and combinational logic with example? discuss the design procedure of combinational logic. [4 + 6]

Ans: The difference between Combinational Circuits and Sequential Circuits are as given below:

Combinational Circuits	Sequential Circuits
The circuit whose output at any instant depends only on the input present at that instant only is known as combinational circuit	The circuit whose output at any instant depends not only on the input present but also on the past output a is known as sequential circuit.
This type of circuit has no memory unit.	This type of circuit has memory unit for store past output.
Examples of combinational circuits are half adder, full adder, magnitude comparator, multiplexer, demultiplexere.t.c	Examples of sequential circuits are Flip flop, register, counter e.t.c
Faster in Speed	Slower compared to Combinational Circuit
 **Figure: Block Diagram of Combination Circuit**	 **Figure: Block Diagram of Sequential Circuit**

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Combinational Logic Circuit Design

Even though CAD tools are used to create combinational logic circuits in practice, it is important that a digital designer should learn how to generate a logic circuit from a specification. Understanding this process allows the designer to better use the CAD tools, and, if need be, to design critical logic sub-circuits by hand.

Design procedure

The design procedure for combinational logic circuits starts with the problem specification and comprises the following steps:

1. Determine required number of inputs and outputs from the specifications.
2. Derive the truth table for each of the outputs based on their relationships to the input.
3. Simplify the Boolean expression for each output. Use Karnaugh Maps or Boolean algebra.
4. Draw a logic diagram that represents the simplified Boolean expression. Verify the design by analyzing or simulating the circuit.

Example

Is input greater than or equal to 5?

Specification

Design a circuit that has a 3-bit binary input and a single output (Z) specified as follows:

- Z = 0, when the input is less than 5_{10}
- Z = 1, otherwise

1. **Determine the inputs and Outputs**
   a. Label the inputs (3 bits) as A, B, C
      - A is the most significant bit
      - C is the least significant bit
   b. The output (1 bit) is Z
      - Z = 1 -> 101_2, 110_2, 111_2
      - Z = 0 -> other inputs
2. **Derive the Truth Table**

Truth Table

A	B	C	Z
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

3. **Simplify the Boolean Expression**

   From the truth table, we use one of the following 2 methods to obtain the simplified Boolean expression
   - Use Karnaugh Map to minimize the logic or
   - From the truth table, get the Canonical Sum ofProducts Boolean expression.

Z = A *.~B * C + A * B * ~C + A * B * CUse Boolean Algebra to simplify the Boolean expression to:**Z = (B + C) * A**

Draw the logic diagram

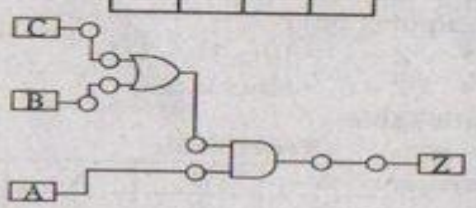
Draw a logic diagram that represents the simplified Boolean expression. Verify the design by analyzing or simulating the circuit.

Boot Expression

Z = (B + C) + A

Truth Table

A	B	C	Z
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1



MODEL QUESTIONS SETS FOR PRACTICE

MODEL SET 1

Course Title: Digital Logic
Course No: CACS105
Nature of the Course: Theory + Lab
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3

Group A

Attempt all the questions. **[10 x1=10]**
Circle (O) the correct answer

1. In which of the following adder circuits, the carry look ripple delay is eliminated?
   a. Half adder
   b. Parallel adder
   c. Full adder
   d. Carry-look-ahead adder
2. Consider a RS flip-flop with both inputs set to 0. If a momentary '1' is applied at the input S, then the output
   a. Q will flip from 0 to 1
   c. Q will flip from 0 to 1 and then back to 0
   b. Q will flip from 0 to 1
   d. Q will flip from 0 to 1 and then back to 0
3. How many full addresses are required to construct an m-bit parallel adder?
   a. m/2
   b. m
   c. m – 1
   d. m + 1
4. the dynamic race hazard problem occurs in
   a. Combinational circuits only
   c. sequential circuits only
   b. Both combinational and sequential circuits
   d. None of above
5. A shift register can be used for
   a. Parallel to serial conversion
   b. Digital delay line
   c. Serial to parallel conversion
   d. All of the above
6. Which of the following flip-flops is free from race around problem?
   a. T flip-flop
   b. Master slave JK flip-flop
   c. SR flip-flops
   d. All of the above
7. The master slave JK flip-flop is effectively a combination of
   a. An SR flip-flop and a T flip-flop
   c. An SR flip-flop and a D flip-flop
   b. A T flip-flop and a D flip-flop
   d. two T flip-flops

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8. The term sum-of-products in Boolean algebra means
   a. The AND function of several OR functions
   c. The OR function of several OR functions
   b. The OR functions of several AND functions
   d. The AND function of several AND functions
9. What table shows the electrical state of a digital circuit's output for every possible combination of electrical states in the inputs?
   a. Function table
   c. Truth table
   b. Routing table
   d. ASCII table
10. The number of two-input NAND gates required to produce the two-input or Function is
   a. 1
   c. 2
   b. 3
   d. 4

Group B

Attempt any SIX questions. **(6x5=30)**

11. Design a full adder circuit using NAND gates only.
12. How 3 bit X OR and X NOR gate can be realized using NAND Gate3 bit XOR gate using NAND gate only.
13. F=XY+X'Z express it into pos form
14. find the subtraction from 17_{10} to 9_{10}using r's and (r-1)'s complement.
15. What do you mean by Duality theorem? Briefly explain about demorgan's theorem and verify it.
16. Solve the following

    $F(w, x, y, z) = \Sigma(1, 3, 7, 11, 15)$ with don't care conditions as

    $D(w, x, y, z) = \Sigma(0, 2, 5)$

    Reduce it using K-map and draw the suitable logic diagram and realized it with NOR gate.
17. What is register? Explain the operation of SISO for the given data sequence 1001.

Group C

Attempt any TWO questions. **(2x10=20)**

18. Implement the following function $F = \Sigma(0, 1, 3, 4, 7, 9)$ using
    a) Decoder
    b) Multiplexer
    c) PLA
19. What is the difference between synchronous and asynchronous counter? Design a MOD-12 synchronous counter showing table diagram, excitation table and K map Simplification.
20. What is magnitude comparator? Design a combinational logic circuit for 4 bit magnitude comparator and explain it.

MODEL SET 2

Group A

Attempt all the questions. **[10 x1=10]**

Circle (O) the correct answer

1. The reduced from of the Boolean expression (A + B) (A + C) is
   a. AB + AC
   b. AC + B
   c. A + B + C
   d. A + BC
2. Which of the following is a universal gate?
   a. AND
   b. EX-OR
   c. OR
   d. NAND
3. Which of the following logic expression is wrong?
   a. 1 + 0 = 1
   b. 1 + 0 + 1 = 1
   c. 1 + 1 = 0
   d. 1 + 1 + 1 = 1
4. The m-bit parallel adder consists of
   a. (m + 1) full adders
   b. m – 1 full adder
   c. m/2 full adders
   d. m full adders
5. A flip can store
   a. 1 bit of data
   b. 3 bits of data
   c. 2 bits of data
   d. 4 bits of data
6. A shift resister can be used for:
   a. Parallel to serial conversion
   b. Digital delay line
   c. Serial to parallel conversion
   d. All of the above
7. Semiconductor memory is
   a. Some what slower than magnetic core memory
   b. A volatile memory
   c. Somewhat larger than the magnetic core memory
   d. All of the above
8. The logic 1 in positive logic system is represented by:
   a. Zero voltage
   b. Higher voltage level
   c. lower voltage level
   d. Negative voltage
9. A combinational logic circuit which is used when it is desired to send data from two or more source through a single transmission line is known as
   a. Encoder
   b. Multiplexer
   c. Decoder
   d. De-multiplexer
10. A logic circuit which is used to change a BCD number into an equivalent decimal number is
   a. Decoder
   b. Multiplexer
   c. Encoder
   d. Code converter

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Group B

Attempt any SIX questions. **(6x5=30)**

11. Perform subtraction from $(1110)_2$ to $(110)_2$ using r's and (r - 1)'s complement method.
12. How the 3-bit XOR and XNOR gate can be realized neither using NOR gate?
13. How the multi neither level NOR circuit can be realized explain with suitable examples.
14. F = A + B'C express it in to SOP form and draw required circuit.
15. What are the characteristics of Digital Logic family? Briefly explain II Llogic.
16. Solve the following:
    F (A, B, C, D) = Σ (0, 5, 8, 14, 15)
17. Explain the operation of PISO shift register with the help of its logic diagram and timing diagram.

Group C

Attempt any TWO questions. **(2x10=20)**

18. Implement the following function F = Σ(1, 3, 4, 8, 14, 15) using
    a) Decoder
    b) Multiplexer
    c) PLA
19. Prove the following Boolean Expression
    i. (A + B)(A + B')(A' + C) = AC
    ii. ABC + AB'C + ABC' = A(B + C)
    iii. ABC' + ABC + AB'C' + AB'C + A'BC = A + BC
    iv. ABC'D' + A'BC'D' + BC'D + BC'D = BC'
    v. XY'+YZ'+ZX'= X'Y+Y'Z+ZX'
20. What are the differences between combinational and sequential circuit? Design a MOD-6 synchronous counter showing state diagram, excitation table and K-map simplification.

MODEL SET 3

Group A

Attempt all the questions.
Circle (O) the correct answer **[10 x1=10]**

1. When simplified with Boolean Algebra (X + Y) (X + Z) simplifies
   a. X
   b. x (1 + yz)
   c. x + x(Y + Z)
   d. x + yz
2. The gates required to build a half adder are
   a. EX-OR gate and NOR gate
   b. EX-OR gate and AND gate
   c. EX-OR gate and OR gate
   d. Four NAND gates

3. The code where all successive number differ from their preceding number by single bit is
   a. Binary code
   b. Excess-3
   c. BCD
   d. Gray
4. If the input to T-flip flop is 100 Hz signal, the final output of the three T-flip flop in cascade is
   a. 1000 Hz
   b. 333 Hz
   c. 500 Hz
   d. 12.5 Hz
5. Which of the memory is volatile memory
   a. ROM
   b. PROM
   c. RAM
   d. EEPROM
6. – 8 is equal to signed binary number
   a. 10001000
   b. 10000000
   c. 00001000
   d. 11000000
7. De-Morgan's first theorem shows the equivalence of
   a. OR gate and Exclusive OR gate
   c. NOR gate and Bubbled AND gate
   b. NOR gate and NAND gate
   d. NAND gate and NOT gate
8. The device which changes from serial data to parallel data is
   a. COUNTER
   b. DEMULTIPLEXER
   c. MULTIPLEXER
   d. FLIP-FLOP
9. A device which converter BCD to Seven Segment is called
   a. Encoder
   b. Multiplexer
   c. Decoder
   d. Flip-flop
10. In a JK flip-flop, toggle means
   a. Set Q = 1 and $\overline{Q} = 0$
   c. Set Q = 0 and Q = 1
   b. Change the output to the opposite state
   d. No change in output

Group B

Attempt any SIX questions. **(8x5=40)**

11. Perform subtraction from $(1110)_2$ to $(110)_2$ using r's and (r-1)'s complement method.
12. How the 3-bit XNOR gate can be realized neither using NOR gate?
13. Design a full subtractor logic circuit using NOR gates.
14. F =A+B'C express it into SOP form.
15. What are the characteristics of digital logic family? Briefly explain.
16. Solve the following:
    F (A, B, C, D) = Σ (0, 5, 8, 14, 15)
    With don't care conditions.
    F (A, B, C, D) = Σ (7, 10, 11)
    Reduce it using K-map and draw the suitable logic diagram and realized it with NAND gate.

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17. What are the application of register? Explain the operation of SISO for the given data sequence 1010.

Group C

Attempt any TWO questions. **(2x10=20)**

18. Implement Full Adder using
    a) Decoder
    b) Multiplexer
    c) PLA
19. What is counter? Design a MOD-10 synchronous counter showing state diagram, excitation table and K-map specification.
20. What is adder? Design and explain BCD adder circuit with suitable examples.

MODEL SET 4

Group A

Attempt all the questions.
Circle (O) the correct answer **[10 x1=10]**

1. When the set of input data to an even parity generator is 0111, the output will be
   a. 1
   b. Unpredictable
   c. 0
   d. Depends on the previous input
2. The number 140 in octal is equivalent to
   a. $(96)_{10}$
   b. $(90)_{10}$
   c. $(86)_{10}$
   d. None of these
3. The NOR gate output will be high if the two inputs are
   a. 00
   b. 10
   c. 01
   d. 11
4. How many flip-flop are required construct mod 30 counter
   a. 5
   b. 4
   c. 6
   d. 8
5. How many address bit are required to represent a 32 k memory
   a. 10 bits
   b. 14 bits
   c. 12 bits
   d. 16 bits
6. The number of control lines for 16 to 1 multiplexer is
   a. 2
   b. 3
   c. 4
   d. 5
7. Which following requires refreshing?
   a. SRAM
   b. ROM
   c. DRAM
   d. EPROM

8. Shifting a register content to left by one bit position is equivalent to
   a. Division by two
   b. Multiplication by two
   c. Additional by two
   d. Subtraction by two
9. For JK flip-flop with J = 1, K = 0, the output after clock pulse will be
   a. 0
   b. High impedance
   c. 1
   d. No change
10. The output of SR flip-flip when S = 1, R = 0 is
   a. 1
   b. No change
   c. 0
   d. High impedance

Group B

Attempt any SIX questions. **(8x5=40)**

11. State and verify the De-Morgan's first and second law using logic gate and truth table.
12. Perform Subtraction from $(17)_{10}$ to $(9)_{10}$ using r's and (r-1)'s complement method.
13. What do you mean by Duality Theorem? Briefly explain the laws used in Boolean Algebra.
14. Solve the following
    $F(w,x,y,z) = \sum(1, 3, 7, 11, 15)$
15. Explain the operation of 4- bit bidirectional shift register.
16. Explain the operation of MOD 10 Asynchronous counter with the help of it's logic and timing diagram.
17. What are the characteristics of Digital Logic Family? Briefly explain TTL logic with suitable example.

Group C

Attempt any TWO questions. **(2x10=20)**

18. What are the difference between combinational and sequential circuit? Implement 12 X 1 Multiplexer using NAND Gates only.
19. Reduce the Boolean expression in simplified form.
    i. ABC+AB'C+ABC'
    ii. ABC'+ABC+AB'C'+AB'C+A'BC
    iii. ABC'D'+A'BC'D'+BC'D+BC'D
    iv. (A+B)(A+B')(A'+C)
    v. A'B'+BC+A'BC'
20. Why the NOR and NAND gates are called as universal gates? Prove the universality of NOR and NAND gate.

MODEL SET 5

Group A

Attempt all the questions.

Circle (O) the correct answer **[10 x1=10]**

1. The number of control lines for 32 to 1 multiplexer is
   a. 4
   b. 16
   c. 5
   d. 6
2. How many two-input AND and OR gates are required to realize Y = CD + EF + G
   a. 2, 2
   b. 3, 3
   c. 2, 3
   d. None of these
3. Which of following cannot be accessed randomly
   a. DRAM
   b. ROM
   c. SRAM
   d. Magnetic tape
4. The excess-3 code of decimal 7 is represented by
   a. 1100
   b. 1011
   c. 1001
   d. 1010
5. When an input signal A = 11001 is applied to a Not gate serially, its output signal is
   a. 00111
   b. 10101
   c. 00110
   d. 11001
6. A universal logic gate is one, which can be used to generate any logic function. Which of the following is a universal logic gate?
   a. OR
   b. XOR
   c. AND
   d. NAND
7. Karnaugh map is used for the purpose of
   a. Reducing the electronic circuit used
   b. To map the given Boolean logic function
   c. To minimize the terms in a Boolean expression
   d. Top maximize the terms of a given a Boolean expression
8. A full adder logic circuit will have
   a. Two inputs and one output
   b. Three inputs and three outputs
   c. Two inputs and two outputs
   d. Three inputs and two outputs
9. An eight stage ripple counter uses a flip-flop with propagation delay of 75 nanoseconds. The pulse width of the strobe is 50ns. Frequency of the input signal which can be used for proper operation of the counter is approximately.
   a. 1 MHz
   b. 2 MHz
   c. 500 MHz
   d. 4 MHz
10. The output of a JK flip-flop with asynchronous present and clear inputs is '1'. The output can be changed to '0' with one of the following conditions:
    a. By applying J = 0, K = 0 and using a clock
    b. By applying J = 1, K = 0, and using the clock
    c. By applying J = 1, K = 1 and using the clock
    d. By applying a synchronous present input.

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Group B

Attempt any SIX questions. **(6x5=30)**

11. Design a half adder logic circuit using only NOR gate.
12. Convert the following decimal numbers into hexadecimal and octal number.

    (a) 304 (b) 224
13. Design the Decoder using Universal gates.
14. What is combinational logic? What are its important features?
15. Describe the clocked RS flip-flop.
16. What do you mean by triggering of flip-flop?
17. What are the shift Register operations?

Group C

Attempt any TWO questions. **(2x10=20)**

18. Draw a block diagram, truth table and logical circuit of a 16 x 1 multiplexer and explain its working principle. Implement 1 X 16 Demultiplexer using smaller blocks.
19. Explain the 4-bit ripple counter with the help of its timing diagram.
20. Design the full subtractor circuit with using Decoder and explain the working principle.

MODEL SET 6

Group A

Attempt all the questions. **[10 x1=10]**

Circle (O) the correct answer

1. The information in ROM is stored
   a. By the user any number of times
   b. By the manufacturer during fabrication of the device
   c. By the user using ultraviolet light
   d. By the user once and only one
2. The 2's complement of the number 1101110 is
   a. 0010001 c. 00100001
   b. 0010010 d. None
3. The decimal equivalent of Binary number 10101 is
   a. 21 c. 31
   b. 26 d. 38
4. How many two input AND gates and two input OR gates are required to realize Y = BD + CE + AB
   a. 1, 1 c. 4, 2
   b. 3, 2 d. 2, 3

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5. How many select lines will a 32:1 multiplexer will have
   a. 5
   b. 9
   c. 8
   d. 11
6. How many address bits are required to represent 4K memory
   a. 5 bits
   b. 8 bits
   c. 12 bits
   d. 10 bits
7. For JK flip-flop J = 0, K = 1, the output after clock pulse will be
   a. 1
   b. 0
   c. No change
   d. high impedance
8. Which of following are known as universal gates
   a. NAND and NOR
   b. XOR and OR
   c. AND and OR
   d. NONE
9. Which of the following memories stores the most number of bits
   a. 64K × 8 memory
   b. 32 M × 8 memory
   c. 1 M × 8 memory
   d. high impedance
10. The complement of variable is always
   a. 0
   b. Equal to the variable
   c. 1
   d. The inverse of the variable

Group B

Attempt any SIX questions. **(6x5=30)**

11. Differentiate between Analog and Digital system.
12. Convert the following octal numbers to hexadecimal.
   a) 1760.46
   b) 6055.263
13. Which gates can be used as inverts in additional to the NOT gate and how?
14. Draw a logic gates that implements the following:
   (a) $A = (Y_1 \oplus Y_2)(Y_3 \odot Y_4) + (Y_5 \oplus Y_6 \oplus Y_7)$
   (b) $A = (X_1 \odot X_2) + (X_3 \odot X_4) + (X_4 \odot X_5) \oplus (X_6 \odot X_7)$
15. State and prove De-Morgan's theorem1st and 2nd with logic gates and truth table.
16. Reduce the following expressions using K-map.
   $A' + B(A + B' + D)(B' + C)(B+C+D)$
17. What are the various types of shift registers? Expalin PISO shift register.

Group C

Attempt any TWO questions. **(2x10=20)**

18. Design the 4-bitsynchronous up/down counter with timing diagram, logic diagram and truth table.
19. Is it possible to implement decoder by using demultiplexer? Justify. Implement 4 X 16 decoder by using smaller blocks.
20. Design a decimal adder with logical diagram and truth table.

MODEL SET 7

Group A

Attempt all the questions. **[10 x1=10]**

Circle (O) the correct answer

1. The device used to convert a binary number to a 7-segment display format is
   a. Multiplexer
   b. Decoder
   c. Encoder
   d. Register
2. An example of data storage device is
   a. RAM
   b. Combinational Circuit
   c. AND Gate
   d. Encoder
3. Full-adder is characterized by
   a. Two inputs and two outputs
   b. Two inputs and three outputs
   c. Three inputs and two outputs
   d. Two inputs and one output
4. The inputs to a full-adder are A = 1, B = 1, C_{in} = 0. The outputs are
   a. $\Sigma = 1, C_{out} = 1$
   b. $\Sigma = 0, C_{out} = 1$
   c. $\Sigma = 1, C_{out} = 0$
   d. $\Sigma = 0, C_{out} = 0$
5. A 4-bit parallel adder can add
   a. Two 4-bit binary numbers
   b. Four bits at a time
   c. Two 2-bit binary number
   d. Four bits in sequence
6. If a 1-of-16 decoder with active-LOW outputs exhibits a Low on the decimal 12 output, what are the inputs?
   a. $A_3A_2A_1A_0 = 1010$
   b. $A_3A_2A_1A_0 = 1100$
   c. $A_3A_2A_1A_0 = 1110$
   d. $A_3A_2A_1A_0 = 0100$
7. A BCD–to -7 segment decoder has 0100 on its inputs. The active outputs are
   a. a, c, f, g
   b. b, c, e, f
   c. b, c, f, g
   d. b, d, e, g
8. If an octal-to-binary priority encoder has its 0, 2, 5, and 6 inputs at the active level, the active-High binary output is
   a. 110
   b. 101
   c. 010
   d. 000
9. In general, multiplexer has
   a. One data input, several data outputs, and selection inputs
   b. One data input, one data output, and one selection input
   c. Several data inputs, several data outputs, and selection inputs
   d. Several data inputs, one data output and selection inputs
10. Data selectors are basically the same as
   a. Decoders
   b. Multiplexers
   c. De-multiplexers
   d. Encoders

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Group B

Attempt any SIX questions. **(6x5=300)**

11. Convert the following hexadecimal number to decimal and octal numbers
    (a) 0FFF (b) 3FFF
12. Design a half adder logic circuit using NOR gates only.
13. Proof the 1st and 2nd law of DeMorgan's theorems with logic gate and truth table.
14. What do you mean by universal gate? Realize the following logic gates using NOR gates.
    (a) OR gate (b) AND gate
15. Draw a logic circuit of 4 × 1 multiplexer.
16. Explain 3 bit Ripple Counter.
17. What do you mean by shift registers? Explain SIPO shift register.

Group C (Long Answer Question Section)

Attempt any TWO questions. **(2x10=20)**

18. Implement full subtractor using:
    a) Decoder
    b) Demultiplexer
    c) PLA
19. What do you mean by full adder and full subtractor?Designa3to 8linedecoder usingtwo2to 4linedecoderand explain it.
20. What is JK master slave flip-flop? Design its logic circuit, truth table and explain the working principle. How it solves the problem of JK Flip-Flop.

MODEL SET 8

Group A

Attempt all the questions.
Circle (O) the correct answer **[10 x1=10]**

1. The term bit means
   a. A small amount of data
   b. Binary digit
   c. A 1 or a 0
   d. Both answers (B) and (C)
2. The time interval on the leading of a pulse between 10% and 90% of the amplitude is the
   a. Rise time
   b. Pulse width
   c. Fall time
   d. Period
3. A pulse in a certain waveform occurs every 10 ms. The frequency is
   a. 1 kHz
   b. 100 Hz
   c. 1 Hz
   d. 10 Hz
4. In a certain digital waveform, the period is twice the pulse width. The duty cycle is
   a. 100%
   b. 50%
   c. 200%
   d. 150%
5. An inverter
   a. Perform the NOT operation
   b. Changes a Low to High
   c. Change a High to a Low
   d. Does all of the above

6. The output of an AND gate is High when
   a. Any input is High
   b. No inputs are High
   c. All inputs are High
   d. Both answers (A) and (C)
7. How many 3 lines to 8 lines decoder are required for a 1 of 32 decoder
   a. 1
   b. 4
   c. 8
   d. 16
8. Convert BCD 0001 0010 0110 to binary
   a. 1111110
   b. 1111000
   c. 1111101
   d. 1111111
9. How many data select lines are required for selecting eight inputs?
   a. 1
   b. 3
   c. 2
   d. 4
10. Which of the following combinations cannot be combined into k-map groups?
   a. Corners in the same row
   b. Diagonal corners
   c. Corners in the same column
   d. Overlapping combinations

Group B

Attempt any SIX questions. **(8x5=40)**

11. i. Convert $(DAFE)_{16}$ to octal number system.
    ii. If A= 31 and B= 17, represent them in Binary and perform A-B using 2's Complement.
12. Differentiate between combinational and sequential circuits with necessary block diagrams.
13. Simplify and implement the following function using a K-map
    Y= (A'BCD') + (A'B'CD) + (ACD) + (A'B'C'D') + (ABCD)
14. Mention the different types of shift registers and explain serial in serial out register when data =1101.
15. Design a full subtractor circuit using a decoder and explain its working principle.
16. Define a multiplexer and construct 8 to 1 MUX using appropriate smaller blocks.
17. Design a combinational circuit that multiplies two 2 bit numbers a_1a_0 and b_1b_0 to produce a 4 bit product $c_3c_2c_1c_0$.

Group C

Attempt any TWO questions. **(2x10=20)**

18. Differentiate between Latch and Flip-flop. Design even parity generator and checker circuit for 4 bit transmission line.
19. Define counter. Design a 4 bit binary synchronous counter with the help of its state diagram, excitation table and K-map simplification.
20. Describe the operation of a full adder circuit. Design a 4 bit parallel adder and explain its advantage over a full adder.

❑❑❑

Society and Tehcnology

New Syllabus

Course title: Society and Technology (3 Cr.)

Course code: CASC102

Year: Semester : I/I

Class load: 3 Hrs./ Week (Theory 3 Hrs)

Course Objectives

The main objective of this course is to make the students familiar with the disciplines of sociology. The goal is to enable them to analyze the Nepalese society and culture, and to understand the relationship between individual, Society and Culture.

Course Description

This course covers several topics of sociology and impact of technology on society that includes basic concept of sociology, organizing social life, social system & social stratification of Nepalese societies, society & technology and research in social sciences which are essential to make computer professionals more responsible towards their society and social norms & values.

Course Details

Unit One: Basic Concept of Sociology **6Hrs**

Definition, of Sociology, Nature and Scope of Sociology, Relationship of Sociology with Other Social Sciences.

Unit Two: Organizing Social Life **6 Hrs**

Society: population Size, and Ditribution, Culture Community, Norms and Values, Status and Role, Institutions: Marriage, Family, Kinship and Groups.

Unit Three: social System & Social Stratification of Nepalese Societies **9 Hrs**

Social Processes & Socialization. Social and Cultural Change in Nepal, Factors of Social and Cultural Change in Nepal, Caste/Ethnicity based Startification, Gender based Startification, Religion based Stratification, Ecological Stratification, National Integration: Historical Process of Nationhood, Cultural Integration (Language, Rituals and Customs).

Unit Four: Society and Technology **12 Hrs**

Technological Society, Technological Changes in Third World Society, Social innovation, Consequences of Technological Development on Nepalese Society. Acontability of Computer Professional toward Society

Unit Five: Research in Social Science **12 Hrs**

Concept of Research in Social Science, Understanding the Concept of Research Methods, Techniques and Tools: Interview, Focus Group Discussion, Observation, Qualitative, Quantitative and Mixed Method in Social Research, Research proposal and its Components: Identification of Research Problem, Formulation of Objectives, Research Design, Formation

of hypothesis/research questions, Sampling design, tool and methods of data collection, Analysis and Presentation of Data, Research Report Writing and Presentation, Computer Softwares on Social Science Research.

Teaching methods:

The general teaching methods includes class lecture, group works and discussion, case studies, guest lectures, research work, project work, assignments and examinations (written and verbal, depending upon the nature of the topics. The Teaching faculty will determine the choice of teaching method as per the need of the topics.

Valuation Procedures

Examination Scheme				
Internal Assessment		External Assessment		Total
Theory	Practical	Theory	Practical	
40	–	60 (3 Hrs)		100

Text Books

1. Andreson, M.L.& Taylor, H.F. (2007). Understanding sociology, New Delhi: Cengage Learning India Private Limited.
2. Bista, D.B. (1996). People of Nepal. Kathmandu: Ratna Prakashan
3. Creswell, J. W. (2011), Research Design: Qualitative, Quantitative and mixed methods approach, New Delhi: SAGE
4. Haralambos M & Heald R.M. (2006). Sociology: Themes and perspectives. New Delhi: Oxford University Press.

Reference Books

1. Bryaman, A. (2008). Social research methods (3rd rd.) New York, New Delhi: Oxford University Press.
2. Central Department of Sociology and Anthropology (1987- 2009), Occasional papers in Sociology and anthropology, Kathmandu.

TRIBHUVAN UNIVERSITY

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

TU QUESTIONS-ANSWERS 2018

Bachelor in Compute applications
Course Title: Society and Technology
Code No: CASO 102
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Candidates are required to answer the questions in their own words as far as possible.

Group A

Attempt all the questions.
Circle (O) the correct answer. **[10 × 1 = 10]**

1. Use of sociology to solve the problems of society is
   a) Basic sociology
   b) Applied sociology
   c) Both a and b
   d) None of these
2. Identify the types of culture
   a) Material Culture
   b) Non-material culture
   c) Both a and b
   d) None of these
3. Social disintegration is a process in which members of a society feel
   a) United
   b) Togetherness
   c) Separated
   d) None of these
4. Polyandry is a form of marriage in which
   a) Many women marry one man
   b) Many mea are husband of one woman
   c) Both a and b
   d) None of these
5. A caste system as a pure theoretical types is based upon
   a) Ascribed status
   b) Social status
   c) Achieved status
   d) Both achieved and ascribed status
6. A large social grouping that shares the same geographical territory and is subject to the same political authority and dominant expectation
   a) Group
   b) Organization
   c) Community
   d) Society
7. Close face to face interactions line family are examples of
   a) Primary social group
   b) Secondary social group
   c) Tertiary social group
   d) None of the above
8. To be a computer professional is
   a) Achieved status
   b) Ascribed status
   c) Both a and b
   d) None of these
9. Technology is
   a) Machine
   b) Artificial things
   c) Apparatus which reduces human efforts
   d) All of the above
10. Mix method in social research indicates.
    a) Qualitative method
    b) Quantitative method
    c) Both a and b
    d) All of the above

Answer-Key

1. (b)	2. (b)	3. (c)	4. (b)	5. (a)	6. (c)	7. (a)	8. (a)	9. (d)	10.(c)

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Group B

Attempt any SIX questions. 6×5=30

11. How sociology is a general science? Discuss with example.

Ans: **Sociology** is a **General Science** and not a Special **Science**. It is concerned with human interaction and human life in general. **Sociology** of course, does not investigate economic, regions, political, legal, moral or any other special kind of phenomena in relation human life and activities as such. It only studies human activities in a **general** way.

Psychology deals **with the** individual, whereas **sociology** is concerned with groups. It has been said that **sociology** is the psychology **of** groups. In many ways, groups act like an individual and **sociology** is concerned with how the different parts **of** the group interact with one another. Anthropology is the study of humankind in all times and places. It involves the careful and systematic study of humankind using facts, hypothesis, and theories. It is concerned with other culture's languages, values, and achievements in the arts and literature. Anthropology is committed to experiencing other cultures.

12. "Family is a primary social institution". Describe its features in third world society

Ans: Family is excessive important first fundamental institutions. Personal development starts from the family, Socialization process starts from family. The family is a group defined by a sexual relationship sufficiently precise and enduring to provide for the procreation and upbringing of children. Family is a group of persons united both the marriage and blood constitution a single household interacting and intercommunicating with each other in their respective social roles of husband and wife, father and mother, son and daughter, brother and sister creating a common culture. Family is the biological, social unit composed of husband, wife and children. There are basically three types of family; 1 Joint family, 2. Nuclear family and 3. Extend family.

Joint family:

Living more than two generation's people (i.e. father, mother, grand parents, grand child, uncle, unit and other emotional relative people -'non blood relative') under the same roof and sharing same kitchen are called the joint family.

Nuclear family:

Living two generation's people (father, mother and their children. But no matter number of children of same parents. under the same roof and sharing same kitchen i.e father, mother and their children. Now, the tendency of nuclear family system is gradually increasing.

Extend family

The persons are not separated since multi generation and they are living under same roof and sharing same kitchen and perform the household duty and others as senior leadership. Basically in Nepal, we can see the extend family in Tharu community of Dang, Banke, Bardia, Kailali and Kanchanpur.

The features of family in the third world society

- It makes Sex or marital relationship
- Family is Universality
- The structure of family determined by the form of marriage

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- It's emotional relationship
- Limited size
- Social regulation
- Permanent and temporally nature
- Common habitation
- Family is a agent or center of personality building
- Determination of lineage (heredity)
- Function of bearing rearing and protection of child
- Provision of residence
- Function of socialization
- Function culture transmission
- Regulation and stable satisfaction of sex needs
- Psychological and affection function
- Religious functions
- Economic functions
- Educational functions

13. Define socialization and describe its stages and agents

Ans: **Socialization** is the process beginning during childhood by which individuals acquire the values, habits, and attitudes of a society. As Webster Dictionary, "The act of adapting behavior to the norms of a culture or society is called **socialization**. **Socialization** can also mean going out and meeting people or hanging out with friends. The word **socialization** can mean "the process of making social." as business dictionary "Process by which individuals acquire the knowledge, language, social skills, and value to conform to the norms and roles required for integration into a group or community" Generally, there are five types of socialization; Primary, Secondary, Developmental, Anticipatory and Resocialization.

Stage of socialization

There are basically 4 stages of socialization

1. The Oral Stage:

In the womb the feotus is warm and comfortable. At birth, the baby faces his first crisis: he must breathe, he must exert himself to be fed, he is susceptible to cold, wet and other discomforts. He cries a good deal in order to attract attention. During the first stage of socialization, he seeks to establish what is called oral dependency. By his cries he is able to build up fairly definite expectations about feeding time and also about his pressing needs for care. At this stages, the baby is not involved in the family as a whole. He/she is rather involved only in the sub system consisting of him and his mother. If the father or any one else in the family performs the role of the mother in caring for the baby no role differentiation is made. That person will also be performing the role of mother. At this stage, the baby does not seem to internalize any role at all. He is so passive as compared to his mother that it is doubtful as to whether he internalized two roles at all. By the time role dependency has been established. His own whether he internalizes two roles at all. By the time oral dependency has been established his own role and that of his mother are probably merged together. This is the stage according to freud Of Primary identification.

2nd stage: Anal Stage

This stage probably beings soon after the first year and extend up to the third year. This period is called anal stage because toilet training is the main focus of attention of the socializing agent, particularly mother. During this stage, the child internalizes two roles his own and that of his mother. These two roles are now clearly separated. The child not only receives care he also receives love and give love in return. During this stage, the child is taught as to how to discriminate between correct and incorrect behavior, first by advice and or hints given by the mother and secondly, by being rewarded or appreciated for correct performance and not rewarded or appreciated for incorrect behavior.

3rd stage : The Puberty Stage

This stage extends from the fourth year to puberty, (i.e. age of 12 ro 13). In the course of the third stage. The child becomes a member of the family as whole. He/ She identifies him/her self with the social role ascribed to him on the basis of his biological sex.

4rth Stage: The adolescence Stage

Adolescence which begins roughly at puberty, is the age during which the young boy or girl has a tendency to get away from parental control. The "Crisis" of this age arises from the fact that adolescent's hander after greater freedom while there is parental control over many activities in which he loves to have his own way.

The Strain involved in transition during the adolescent period depends upon the cultural definition of adult roles. In some societies vital decision concerning adolescents are taken by the parents or guardians. That makes transition easier. Thus the choice of marriage partner is made by elders within conventional rules.

Agents of socialization

The primary **agents of socialization** are;

1. The Family. The home is the first place an individual makes his first contact. ...
2. The School. The school is the greatest agent of socialization. ...
3. The Peer-Group. ...
4. The Temples, Church/Mosque and Role. ...
5. The Mass Media.

14. What is technological society? Describe its features in third world society.

Ans: The central concept defining a technological society is technique. "In our technological society, technique is the totality of methods rationally arrived at and having absolute efficiency in every field of human activity. " Ellul argues that modern society is being dominated by technique, which is defines as a series of means that are established to achieve an end. Technique is ultimately focused on the concept of efficiency. The term "Technique" is to be comprehended in its broadest possible meaning as it touches upon virtually all areas of life, including science, automation, but also politics and human relation.

Technology society and life or **technology and culture** refers to dependency co-dependence, co-influence, and co-production of technology and society upon the other (technology upon culture, and vice versa). This synergistic relationship occurred from the dawn of humankind, with the invention of simple tools and continues into modern technologies such as

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the printing press and computers. The academic discipline studying the impacts of science, technology, and society.

Relationship between the **society** and **technology**. **Technology** is very important aspect of human condition as it provides cloths, shelters, foods, transportations etc. **Technological** determinism is the theory that **technology** is an autonomous force that changes **society** and it is also the key force to our **society**.

Feature of technology and society

1. Technology has become a huge part in society and day-to-day life
2. Improvement in communication and information system
3. Improvement to identified the diseases
4. Improvement in health access and modern facilities to identification and treatment of the diseases
5. Easy to perform the task
6. Easy access in transportation
7. Easy access of education and research work
8. Easy in administration work
9. Easy in documentation and storage of the information
10. Easy to industrial production
11. Easy in agricultural production and processing etc.

15. What are the key research methods in social science?

Ans: The term "**research methods**" typically refers to the strategy of plan that a researcher has devised in order to gather data. While "**research** methodology" sounds similar to "**research method**," **research** methodology refers to the body of practices that govern the acquisition of knowledge within a given field. The **scientific method**, as applied to **social sciences**, includes a variety of **research** approaches, tools, and **techniques**, for collecting and analyzing qualitative or quantitative data. These **methods** include laboratory experiments, field surveys, case **research**, ethnographic **research**, action **research**, and so forth. There are so many research methods in social science i.e quantitative, qualitative, primary and secondary data and defining the basic types of **research method** including social surveys, experiments, interviews, participant observation, ethnography and longitudinal studies. But there are three key methods in social science these are;

1. Quantitative Research Methods

Quantitative Research Methods involves a large population. more people meanse more data. With more data to analyze, you and obtain more accurate results. This methods used close ended quations because the research are tipically looking to gathers statistical data online surveys, questionnaires, and poll are preferable data collection tools used in quatitative research.

2. Qualitative Research Methods

Qualitative research is a process that is about inquiry. It helps create in depth understanding of problems of issues in their natural settings. This is a non statistical methods. Qualitative research is heavily dependent on the expensive of the research and the question, used to probe the sample. The sample size is usually restricted to 6-10 people. Open ended question are asked in manner that encourage answer that lead to another questions or group of questions. The purpose of asking open ended question is gathers as much information as possible from the sample. Methods of Qualitative Research are as follows

1. One to one interview
2. Focus group discussion
3. Ethnographic research

4. Content/Text analysis
5. Case Study research
1. Mixed Research Methods **methods**

As mixed methods, used both qualitative and quantitative research methods.

16. What is kinship? Discuss its types.

Ans: Kinship is the socially recognized relationships between people in a culture, who are either held to be biologically related or given the status of relatives by marriage, adoption, or other rituals. Kinship is a broad ranging terms for all the relationships that people are born into or create later in life that are considered binding in the eyes of their society. Although customs vary as to which bonds are accorded more weight, their very acknowledgement defines individuals and roles that society expects them to play. Kinship encompasses the norms, roles, institutions and cognitive processes referring to all the social relationship that people are born into, or create later in life, and that are expressed through, but not limited to a biological idiom.

Types of Kinship

In any society, kin relationships are based either on birth (blood relations) consanguine Kinship, or marriage. These two aspects of human life are the basis for the two main types of kinship in society;

1. Consanguineal Kinship
2. Affinal Kinship

1. **Consanguineal Kinship**: It refers to the relationships based on blood, i.e., the relationship between parents and children, and between siblings are the most basic and universal kin relations.
2. **Affinal Kinship:** It refers to the relationships formed on the basis of marriage. The most basic relationship that results from marriage is that between husband and wife.

17. What are the factors of social and cultural changes? Discuss only three factors.

Ans: There are many factors which affects to change the social and cultural. Among of them some of them are as follows;

1. Physical Environmental factors
2. Demographic Factors
3. Cultural Factors
4. Ideational Factors
5. Economic Factors
6. Political Factors

1. **Physical Environmental Factors**

Certain geographic changes sometimes produce great social change. Climate, storms, social erosions, earthquakes, floods, droughts et definitely affect social life and induce social change, Human life is closely bound up with the geographical conditions of the earth. Human history is full of examples that flourishing civilizations fell prey to natural calamities. The distribution of population over various regions, the variations in the population densities, the agricultural production, flora and fauna, the joys and

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hardships all indicates a change when a change in the physical environment occurs.

2. **Demographic Factors**

Broadly speaking, demography is concerned with the size and structure of human population. The social structure of a society is closely related with the changes in the size, composition and distribution of population. The size of the population is based mainly upon three factors birth rate, death rate and migration (immigration and emigration). The composition of population depends upon variables like age, sex marital status, literacy etc. Changes in demographic structure, which may be caused by changes in mortality rates,, will produce changes in the ratio of breadwinners to dependents. Such a change can have consequences for the structure of family, kinship, political and other institutions. The size of population affects each of quite personally.

3. **Economic Factors**

Of Economic influences, the most far reaching is the impact of industrialization. It has revolutionized the whole way of life, institutions, organizations and community life. In traditional production systems, levels of production were fairly static since they were geared to habitual, customary needs. Modern industrial capitalism promotes the constant revision of the technology of production, a process into which science is increasingly drawn. The impact of industrialization (science and technology) we can easily see on Indian family system (joint family) and caste system. (For detailed analysis of the influence of economic factor, see Marx's views discussed in Economic. Theory of Social Change.

Group C

Attempt any TWO questions.

18. What is national integration ? Discuss its major dimensions. 2×10=20

Ans: National Integration is the feeling of togetherness or oneness towards one's own country irrespective of their individual differences with regard to religion, region, race, culture or caste. National integration isn't only about national spirit. It involves a feeling that brings peoples from all areas, dialects and beliefs together in a common endeavor. When national integration occurs, individuals are likely to work together to build systems that enhance the prosperity of a nation and its people. Some things that can get in the way of national integration include religious or political divides as well as communication barriers between citizens. There are major 4 dimension of the national integration those are;

1. Political Dimension
2. Social Dimension
3. Economic dimension
4. Physical dimension

1. **Political Dimension**

Politically, national integration is the condition of sharing power by people of different strata at the state affairs, where the state attempts to create a congenial atmosphere in order to secure people's genuine participation and their involvement

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voluntarily and spontaneously. People from different walks of life have their fair representation at M House where decision that affects the people are made jointly; parliamentary debates **are carried out in a democratic manner; voices of minority are** heard and the minority is given due respect so as to secure their full participation in the state affairs and policies are formulated to maat their demands, interests and needs. Policies are formulated to secure the participation of the depressed and downtrodden segment of the society in administration, civil service, army and police so that people's significant participation can be secured to mobilize national resources wisely for people's benefits in the country. The state should provide a forum where people of different ideological backgrounds can be accommodated in the process-of decision making activities through mutual interaction and sharing Of experiences on a regular basis. It was also suggested that the state should have a uniform system to provide opportunities to the people, and recruit people in the state system in such a way that the people from backward caste and ethnic groups can also enjoy the benefits of the state-run welfare programs.

2. **Social Dimension**

Nepal is a mosaic of different caste and ethnic groupings scattered all over the country where cultural difference 78 that prevail widely are primarily emanated 01 Hindu caste hierarchy adopted in the country. Their cultural differences can be minimized when their functional interdependency can be enhanced in the social system. This can be accomplished only upon the implementation and coordination of relationships among the people of different social backgrounds such as caste, religion, language, ethnic group, occupation, class, etc. an this coordination should be based on the principles of equality and non-discriminated policy, practice and behaviors. In a straight sense, there should be no discrimination against any individual on the basis of caste, sex, religion, ethnic groups, etc. The untouchability that is deeply rooted in Nepali society be eradicated socially. Its elimination by legal provision has been proved quite ineffective and inefficient in our culture and identity of all caste, ethnic grpups and religion should be maintained as charted out in the *Malaki Ain* of the country. In this way only harmony among people can be brought out and uniformity accomplished. In order to achieve all these points mentioned above, it is necessary to create an environment of judiciary equity where everybody will be equal to law.

3. **Economic Dimension**

The distribution of wealth and income is one indicator of measuring economic equality in the country. The indicate such as minimum basic income (MBI) indicates that 42.5 percent of the total population is below poverty line. Without eradicating this poverty, it is difficult to raise the living standard of the people in the country. There still lacks. the coordinated plan to use the local

resources skills and sources. And people have not been able to tap the opportunities that are available around them due to reasons such as ignorance, lack of skills, primitive technology, etc. The specialized skills of the terai people, coupled with hard work and bravity and enterprising capability of the mountain residents should be merged skillfully to bring in economic integration in the country so that a self-reliant development can be achieved to distribute benefits and fruits of development to people - regardless of their economic and social status. A provision of uniform economic conditions and opportunities should be made available and a congenial environment should be created so as to have access to these opportunities on the basis of achieved qualities such as educational qualifications, skills, including, backwardness and remoteness,

4. **Psychological Dimension**

National integration, from psychological perspective, is the feeling of unity developed in people and their emotional attachment to nation, Infact it is the feeling of people, who feel and develop the sense of unity and brotherhood without any interference and imposition from outside. This feeling is strengthened by the people especially a the time of crisis, when sovereignty of a nation is endangered by external influence or cultural or political invasion. At this time, we need to develop a feeling of "we are one". This feeling can not be raised without any massive program geared to enhance the feeling of

19. Discuss the accountability of computer professionals towards society with examples.

Ans: Computer professionals for Social Responsibility (CPSR) was a global organization promoting the responsible use of computer technology. CPSR was incorporated in 1983 following discussions and organizing that began in 1981. It educated policy makers and the public on a wide range of issues. CPRS incubated numerous projects such as privaterra, the public Sphere project, the Electronic Privacy Information center, the 21st Century project, the civil Society Project, and the Computers, Freedom and privacy Conference. Founded by U.S. computer scientists at Stanford University and Xerox PARC, CPSR had members in over 30 countries on six continents . CPSR was a non profit 501. C.3 organization registered in California.

When CPRS was established, It was concerned solely about the use of computers in warfare. It was focused on the strategic computing initiative, a US Defense project to the Strategic computing initiative, a US Defense project to use artificial intelligence in military systems, but added opposition to the strategic Defense Initiative (SDI shortly after the program was announced. The Boston chapter helped organize a debate related to the software reliability of SDI systems which drew national attention (Software Seen as obstacle in developing Star Wars, Philp M Boffey, (the New Your Times, September 16, 1986) to these issues. Later, workplace issues, privacy, and community networks were added to CPRS's agenda.

CPSR began as a chapter based organization and had chapters in Palo Alto, Boston, Seattle, Austin, Washington DC, Portland and other US locations as well as a variety or international chapters including Peru and Spain. The chapters often developed innovative projects including a slide show about the dangers of launch on warning and the Seattle Community Network.

CPRS sponsored two conferences: the participatory Design Conferences which was held biennially (Douglas Schuler, Public Sphere Project, (2013) and the Directions and implications of Advanced Computing DIAC symposia have been convened roughly every other year since that time in conjunction with the community information Research Network (CIRN) annual conference. Four books Technology, Rediscovering Community; community Practice in the Network Society; Shaping the Network Society; Liberating Voices; A Pattern Language for communication revolution") and two special sections in the communications of the ACM (Social Responsibility" and "social computing" resulted from the DIAC symposia.

20. What are the basis steps of proposal writing in social research describe in brief.

Ans: Research proposal is the overall plan or blue print to conduct the research. Researcher explained in details Who, What, When, Where, How he/she is going to take conduct the research. The research proposal can not be similar in all situation and place. Because it differs as a guidelines given by institutions, university and other organizations as well as supervisor itself. But in general following format or process could be appropriate.

1. Research title
2. Introduction
3. Statement of the problems
4. Objectives
5. Research Questions
6. Hypothesis formulation
7. Expected Outcomes
8. Rational of the study
9. Limitation of the study
10. Literature review
11. Theoretical framework
12. Conceptual Framework
13. Research Methods
    - i. Research Design
    - ii. Sample size, Sample procedure, Sample Technique
    - iii. Sampling tools
    - iv. Data collection procedure
    - v. Data analysis procedure and instruments
14. Time Schedule (Gyan Chart)
15. Budgets (if required)
16. References.

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Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

TU QUESTIONS-ANSWERS 2019

Bachelor in Compute applications
Course Title: Society and Technology
Code No: CASO 102
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Candidates are required to answer the questions in their own words as far as possible.

Group B

Attempt any SIX questions.

11. Define sociology and discuss its nature. **6×5=30**

Ans: Sociology is a science of society. As a social science it attempts to study social life as a whole. But for the understanding of social life as a whole sociology requires the help of other social sciences which studies a particular aspect of society. Economic studies the economic aspects whereas political science studies political aspect. Hence it is obvious that other social sciences are closely related to sociology. Sociology is considered as the mother of social science. Besides sociology synthesizes other social sciences. Hence here exists a very close and intimate relationship between sociology and other social sciences. For our precise understanding of the relationship between sociology and other social sciences.

Nature of sociology

1. **Sociology** is the branch of knowledge and it has its own characteristics. **Sociology** has different **nature** in society. It is different from other
2. **Sociology** is the generalizing and not a particularizing or individualizing science :- **Sociology** tries to find out the general laws or principles about human interaction and association, about the **nature**, from, content and the structure of human groups and societies.
3. As it has to deal with society it includes all aspects of human life in a general way.
4. **Sociology** is both a rational and an empirical science. It studies the social phenomena in scientific way.

12. Show the similarities and differences between sociology and anthropology.

Ans: Sociology and Anthropology are social science disciplines that focus on studying the behavior of humans within their societies. The similarity and difference between sociology and anthropology are as follows;

Similarity

1. **Sociology and anthropology** combine scientific and humanistic perspectives in the **study** of society
2. Many institutions combine both disciplines into one department due to the **similarities between** the two.

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Difference

1. Difference between the two social sciences is that sociology concentrates on society while anthropology focuses on culture
2. **Anthropology science of man**: Anthropology studies cultures, religions, small-scale interactions (in tribes or collectives or small groups), and mainly uses ethnography (field work), narrative studies and qualitative methods.
3. **Sociology science of society**: Sociology, on the other hand, studies politics, economics, macro-relationships, social interactions, the influence of concepts such as power, ideology, class, etc., forms of organization, etc. Sociology tends to rely more on "classic" theory (linguistics, philosophy, politic economy, Marxism, etc.

13. What are the major functions of family

Ans: Family is excessive important first fundamental institutions. Personal development starts from the family, Socialization process starts from family. The family is a group defined by a sexual relationship sufficiently precise and enduring to provide for the procreation and upbringing of children. Family is a group of persons united both the marriage and blood constitution a single household interacting and intercommunicating with each other in their respective social roles of husband and wife, father and mother, son and daughter, brother and sister creating a common culture. Family is the biological, social unit composed of husband, wife and children. The major functions of family are as follows;

Function of family

- Function of bearing rearing and protection of child
- Provision of residence
- Function of socialization
- Function culture transmission
- Regulation and stable satisfaction of sex needs
- Psychological and affectional function
- Religious functions
- Economic functions
- Educational functions

14. Discuss the class based social stratification in Nepalese society.

Ans: In this way the concept of **stratification** emerged in the **society and** inequality got . On the whole caste system has an important role in **social stratification in Nepal**. **Class based** inequality A **social class** is a group of individuals who occupy. The **Nepalese** caste system is the traditional system of **social stratification** of **Nepal**. The **Nepalese** caste system broadly borrows the classical Hindu Chaturvarnashram model consisting of four broad **social classes** or varna:

1. Brahmin (Priest)
2. Kshatriya (Warrior)
3. Vaishya (Merchant or farmer
4. Sudra (Labourer)

As this system, the Brahmin are in higher class, Kshatriya are in second higher class class, Vaishya are in third higher class and Sudra are in the lower class.

As 2011 census of Nepal, there are identified 125 caste ethnic groups and 123 languages. Among of them, kshatriya are 16.6 percent, Brahmin are 12.2 percent, Magar are 7.1 percent, Tharu are 6.6 percent, Tamang are 5.8 percent, Newar are 5 percent and Kami are 4.8 pecent

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15. What do you understand by social change? Discuss some of the major factors of social change.

Ans: **Social change** is a concept many of us take for granted or don't really even **understand**. ... Sociologists define **social change** as **changes** in human interactions and relationships that transform cultural and **social** institutions. These **changes** occur over time and often have profound and long-term consequences for society. **Examples** of significant **social changes** having long-term effects include the industrial revolution, the abolition of slavery, and the feminist movement.
It means a value **change**, significant institutional modifications and improvement.
Thus, **social change** is brought about by a number of **factors** such as

1. Geographical,
2. Biological,
3. Demographic,
4. Technological,
5. Industrial,
6. Economic,
7. Ideological,
8. Cultural,
9. Psychological,
10. Educational and
11. Voluntary acts of the individual.

16. What is research proposal? Formulate a research proposal with its major components.

Ans: Research proposal is the overall plan or blue print to conduct the research. Researcher explained in details Who, What, When, Where, How he/she is going to take conduct the research. The research proposal can not be similar in all situation and place. Because it differs as a guidelines given by institutions, university and other organizations as well as supervisor itself. Required the following steps to formulate the research'

1. Research title
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3. Statement of the problems
4. Objectives
5. Research Questions
6. Hypothesis formulation
7. Expected Outcomes
8. Rational of the study
9. Limitation of the study
10. Literature review
11. Theoretical framework
12. Conceptual Framework
13. Research Methods
    i. Research Design
    ii. Sample size, Sample procedure, Sample Technique
    iii. Sampling tools
    iv. Data collection procedure
    v. Data analysis procedure and instruments
14. Time Schedule (Gyan Chart)
15. Budgets (if required)
16. References.

17. Discuss the major concepts of research in social science research.

Ans: Word 'Research is comprise of two words = Re+ search. It means to search again. So research means a systematic investigation or activity to gain new knowledge of the already existing facts.

A **concept** is a theoretical idea, which in **social science** is usually linked in some way to empirical 'reality. Research is an intellectual activity. It is responsible for bringing to light new knowledge, It is also responsible for correcting the present mistakes, removing existing misconceptions and adding new learning to the existing fund of knowledge. Research is a systematic, formal and intensive process of carrying on the scientific method of analysis. There are many ways of obtaining knowledge. They are intuition, revelation, and authority logical manipulation of basic assumptions, informed guesses, observation, and reasoning by analogy.

- The purpose of research in social science is to discover answers to questions through the application of scientific procedure and to find out the truth which is hidden and which has not been discovered as yet the social events. Social science research is directed toward the solution of the social problems and it requires expertise. Social Science research always emphasizes the development of generalizations, principles, or theories that will be helpful in predicting future occurrences. The social science research is based upon observable, experiences or empirical evidences.

Group C

Attempt any TWO questions. **2×10=20**

18. Define socialization and describe its stages and agents.

Ans: **Socialization** is the process beginning during childhood by which individuals acquire the values, habits, and attitudes of a society. As Webster Dictionary, "The act of adapting behavior to the norms of a culture or society is called **socialization**. **Socialization** can also mean going out and meeting people or hanging out with friends. The word **socialization** can mean "the process of making social." as business dictionary "Process by which individuals acquire the knowledge, language, social skills, and value to conform to the norms and roles required for integration into a group or community" Generally, there are five types of socialization; Primary, Secondary, Developmental, Anticipatory and Resocialization.

Stage of socialization

There are basically 4 stages of sociolisation

1. The Oral Stage

In the womb the feotus is warm and comfortable. At birth, the baby faces his first crisis: he must breathe, he must exert himself to be fed, he is susceptible to cold, wet and other discomforts. He cries a good deal in order to attract attention. During the first stage of socialization, he seeks to establish what is called oral dependency. By his cries he is able to build up fairly definite expectations about feeding time and also about his pressing needs for care. At this stages, the baby is not involved in the family as a whole. He/she is rather involved only in the sub system consisting of him and his mother. If the father or any one else in the family performs the role of the mother in caring for the baby no role differentiation is made. That person will also be performing the role of mother. At this stage, the baby does not seem to internalize any role at all. He is so passive as compared to his mother that it is doubtful as to whether he internalized two roles at all.

By the time role dependency has been established. His own whether he internalizes two roles at all. By the time oral dependency has been established his own role and that of his mother are probably merged together. This is the stage according to freud of Primary identification.

2. 2nd stage: Anal Stage

This stage probably beings soon after the first year and extend up to the third year. This period is called anal stage because toilet training is the main focus of attention of the socializing agent, particularly mother. During this stage, the child internalizes two roles his own and that of his mother. These two roles are now clearly separated. The child not only receives care he also receives love and give love in return. During this stage, the child is taught as to how to discriminate between correct and incorrect behavior, first by advice and or hints given by the mother and secondly, by being rewarded or appreciated for correct performance and not rewarded or appreciated for incorrect behavior.

3. 3rd stage : The Puberty Stage

This stage extends from the fourth year to puberty, (i.e. age of 12 or 13). In the course of the third stage. The child becomes a member of the family as whole. He/ She identifies him/her self with the social role ascribed to him on the basis of his biological sex.

4th Stage: The adolescence Stage

Adolescence which begins roughly at puberty, is the age during which the young boy or girl has a tendency to get away from parental control. The "Crisis" of this age arises from the fact that adolescent's hander after greater freedom while there is parental control over many activities in which he loves to have his own way.

The Strain involved in transition during the adolescent period depends upon the cultural definition of adult roles. In some societies vital decision concerning adolescents are taken by the parents or guardians. That makes transition easier. Thus the choice of marriage partner is made by elders within conventional rules.

Agents of socialization

The primary **agents of socialization** are:

1. The Family. The home is the first place an individual makes his first contact. ...
2. The School. The school is the greatest agent of socialization. ...
3. The Peer-Group. ...
4. The Temples, Church/Mosque and Role. ...
5. The Mass Media.

19. Discuss historical process of nationhood in Nepal.

Ans: Nationalism reflects the desire of "Nations" for a system of government that secures their interests and fundamental character. Nationalism has also come to mean an expression of identify that glorifies, or at least invokes, a deep and abiding connection between individuals of the "nation" that informs, complements, and often transcends other identities rooted in religious beliefs and affiliation, class imperatives, gender roles, and regional affinities, The real sticking point in much of the literature relates to how one defines "nation" and how early "true" nationalism can be said to exist. Originally nations were assumed to be self evident. Nations were a people sharing a common immutable ethnicity, which

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dated to the mists of time and could be seen by their shared language, history, bloodline, culture, character, habits, and manners.

Prehistory of nationhood in Nepal

Prehistoric site of Paleolithic, Mesolithic and Neolithic have been discovered in the Siwalik Hill of Dang District. The first documented tribes in Nepal are Kirat people, who arrived into Nepal roughly 2500 years ago and moved into the Kathmandu Valley, before being made to retreat by the invading Lichhavi from India. According to some legendary accounts in the chronicles, the successors of Nepal were the Gopalavamsi, Gopal Bansa or "Cowherd family" are said to have ruled for some 49 years then followed by the Mhaisapalavamsa or Buffalow herder Dynasty established. Then after Kirat Dynasty, Licchavi Dynasty, Simroun Dynasty, Thakuri Dynasty. Thakuri dynasty was a Rajput Dynasty. After Aramudi, who is mentioned in the Kashmirian chronicle, the Rajatarangini of Kalhana. Many thakuri Kings ruled over part of the country up to the middle of the 12th century. After Thakuri dynasty, ruled by the Malla Dynasty since middle of 12 century in Nepal. After Malla Dynasty, the Shah dynasty ruled in Nepal. Shah dynasty's King Prithvi Narayan Shah (1779 – 1875), has unification of the Nepal. With whom we move into the modern period of Nepal's history was the 9th generation descendant of Dravya Shah (1559-1570) founder of the ruling house of Gorkha. Gorkha rule, Rana Rule, Multiparty Parliaments 1990. Nepal Civil war 1996 – 2006). Federal Democratic Republic on May 2008. Protests over the constitution of 2015.

20. **Do you think technology plays an important role in the development of society? Explain.**

Ans: Technology is the application of scientific knowledge to the making of tools to solve specific problems. Technological advances such as automobiles, airplanes, radio, television, cellular phones, computers, modems, fax machines have bought major advance changes to the world. Indeed, 20th century technology has completely and irreversibly changed the way people meet, interact, learn, work play, travel, worship, and do business.

Technological information increase exponentially: the entire database of scientific knowledge doubles every several years. This "technological explosion" is due in part to an information explosion," as well as to advances in storage, retrieval, and communication of data.

As experiences of global present situation, the technology plays an important role in the development of the society;

Infrastructure development. Third world countries including Nepal, have developed the sustainable infrastructure plan in the help of technology to improvement the economic growth. This countries also achieve sustainable development in different fields such as schools, factories, roads, industries, agriculture, hydropower, tourism, health facilities and health care system, and also developed the norms, values, beliefs, culture and knowledge of the people through the technology. Society people are getting better education through the innovative curriculum. Technology is also supporting to getting the fund rising and communication each other within the second.

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MODEL QUESTIONS SETS FOR PRACTICE

MODEL SET 1

Bachelor in Compute applications
Course Title: Society and Technology
Code No: CASO 102
Semester: I

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Candidates are required to answer the questions in their own words as far as possible.

Group A

Attempt all the questions. **10 × 1 = 10**
Circle (O) the correct answer.

1. What is the core area of sociology?
   a) Study of mental interaction and interdependence.
   b) Study of social interaction and interdependence.
   c) Study of technological interaction and interdependence.
   d) Study of political interaction.
2. What is the name of the process by which we are stratified into different layers of society?
   a) Social Control b) Social Conflict
   c) Social Solidarity d) Social Stratification
3. Who coined the term 'sociology'?
   a) Karl Marx b) Marx Weber
   c) Auguste Comte d) A.L. Kroeber
4. Which is the key factor of acceptance of technological innovation as suggested by Kingsley Davis?
   a) Social Stratification b) Social Control
   c) Social Solidarity d) Attitude toward change
5. Which is the L.A. White's view on the culture technology?
   a) C = TXC b) C = TXE
   c) C = TXM d) C = TXS
6. What do you mean by when contact among different cultural group that changes in the some cultural elements either one or other group?
   a) Co-operation b) Acculturation
   c) Conflict d) Competition
7. The statement 'technology is the means of production' is by,
   a) Max Weber b) Emile Durkheim
   c) Karl Marx d) Auguste Comte
8. What do you mean by quantitative data?
   a) Based on numerical value b) Based on quality
   c) Based on non-numerical value d) Base on experience

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9. Which is the Manuel Castell's view on the society and technology?
   a) Risk society
   b) Information society
   c) Technology society
   d) Network society
10. What is social research?
   a) Systematic method of discovering the new knowledge.
   b) Systematic study of society.
   c) Systematic study of human.
   d) Systematic study of culture.

Group B

Attempt any SIX questions. **[6 × 5 = 30]**

11. How sociology is a general science? Discuss with examples.
12. "Family is a primary social institution". Discuss with suitable examples.
13. Define socialization and describe its stages and agents.
14. What is technological society? Describe its features in third world society.
15. What are the key research methods in social science?
16. What is kinship? Discuss its types.
17. What are the factors of social and cultural changes? Discuss only three factors.

Group C

Attempt any TWO questions. **[2 × 10 = 20]**

18. What is national integration? Discuss its major dimensions.
19. What is research proposal? Describe its major components.
20. Write an essay on the impact of technological development in Nepalese Marriage Institution.

MODEL SET 2

Candidates are required to answer the questions in their own words as far as possible.

Group A

Attempt all the questions. **[10 × 1 = 10]**

Circle (O) the correct answer.

1. Which group of scholars are called the fathers of sociology?
   a) A. Comte, H. Spencer, G. Ritzer and M. Weber.
   b) M. Weber, E. Durkheim, K. Marx and H. Spencer.
   c) A. Comte, H. Spencer, E. Durkheim and M. Weber.
   d) A. Comte, H. Spencer, A. Inkeles and M. Weber
2. When was the term sociology coinded?
   a) 1738
   b) 1838
   c) 1748
   d) 1848

3. In society, we can see rich, middle and poor is .....based stratification.
   a) Sex
   b) Class
   c) Gender
   d) Caste
4. Culture is.....behavour.
   a) Development
   b) Learnt
   c) Missed
   d) None of them
5. .....Is not social institution.
   a) Family
   b) Gender
   c) Marriage
   d) Kinship
6. A large social grouping that shares the same geographical territory and is subject to the same political authority and dominant expectation
   a) Group
   b) Organization
   c) Community
   d) Society
7. Close face to face interactions line family are examples of
   a) Primary social group
   b) Secondary social group
   c) Tertiary social group
   d) None of the above
8. To be a computer professional is
   a) Achieved status
   b) Ascribed status
   c) Both a and b
   d) None of these
9. Technology is
   a) Machine
   b) Artificial things
   c) Apparatus which reduces human efforts
   d) All of the above
10. Mix method in social research indicates.
   a) Qualitative method
   b) Quantitative method
   c) Both a and b
   d) All of the above

Group B

Attempt any SIX questions. 6×5=30

11. Define sociology with examples.
12. Write about the Ogburn's view on technology and society.
13. What roles does technology play in national Integration?
14. What are the features of technological society?
15. Define social research.
16. Distinguish between community and society.
17. Discuss briefly technological based social change in Nepal.

Group C

Attempt any TWO questions. 2×10=20

18. Define social stratification and discuss social stratification in the context of Nepal.
19. Discuss the accountability of computer professionals towards society with examples.
20. What are the basis steps of proposal writing in social research? Describe in brief.

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MODEL SET 3

Group A

Attempt all the questions. 10×1=10

Circle (O) the correct answer.

1. Use of sociology to solve the problems of society is
   a) Basic sociology b) Applied sociology
   c) Both a and b d) None of these
2. Identify the types of culture
   a) Material Culture b) Non-material culture
   c) Both a and b d) None of these
3. Social disintegration is a process in which members of a society feel
   a) United b) Togetherness
   c) Separated d) None of these
4. Polyandry is a form of marriage in which
   a) Many women marry one man
   b) Many mea are husband of one woman
   c) Both a and b
   d) None of these
5. A caste system as a pure theoretical types is based upon
   a) Ascribed status b) Social status
   c) Achieved status d) Both achieved and ascribed status
6. The full form of SPSS is.....
   a) Social Package for the Social Sciences.
   b) Scientific Package for the Social Sciences.
   c) Statistical Package for the Social Sciences.
   d) Systematic Package for the Social Science.
7. .....is a type of social norm.
   a) Caste b) Class
   c) Mores d) Gender
8. Nepal was politically unified in.....
   a) 1668 AD b) 1768 AD
   c) 1868 AD d) 1568 AD
9. Statistics is used primarily to analyse
   a) Qualitative data b) Quantitative data
   c) Primary data d) Secondary data
10. Third world societies are known as
   a) Developed societies b) Underdeveloped societies
   c) Asian societies d) American societies

Group B

Attempt any SIX questions. [6×5 =30]

11. "Society can't develop without technology". Justify with your view.
12. Discuss the schools of thought under the scope of sociology.
13. Compare and contrast between family and marriage.
14. Define social science research.
15. What are the major components of research proposal?
16. Discuss the historical process of Nepali nationhood.

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17. Write short-notes on. (Any two)
    a) Mixed research method.
    b) Social group.
    c) Action research.

Group C

Attempt ay TWO questions. **[2 × 10 = 20]**

18. What are the socio-cultural bases of technological change? Discuss.
19. Is sociology a science? Justify your answer with suitable examples.
20. Discuss major research methods in social science research.

MODEL SET 4

Candidates are required to answer the questions in their own words as far as possible.

Group A

Attempt all the questions **[1×10 =10]**

Circle (O) the correct answer.

1. August Comte first coined the word sociology in....
   a) 1864 b) 1818 c) 1838 d) 1883
2. Sociology is the scientific study of.....
   a) Society b) Community c) Culture d) Technology
3. Culture is of two types in forms.....
   a) Rural and Urban b) Hunting and Gathering
   c) Material and non-material d) All of the above
4. A social role is the expected behaviour associated with a social position said by.....
   a) Young and Mack b) Duncan Mitchell
   c) Talcott Parsons d) Robert Bierstadt
5. Which is not the agent of socialisation?
   a) Family b) Peer group c) The state d) Primary socialisation
6. Caste is characterised by.....
   a) Hierarchical division of society b) Concept of pure and impure
   c) Restriction on mate selection d) Above all
7. Who introduced the wireless telephone in Himalayan region and established the Rsstriya Abiskar Kendra?
   a) Sunduk Ruit b) Mahabir Pun
   c) Dayananda Bajracharya d) Luzendra Ojha
8. Major types interview are.....
   a) Open ended b) Close ended
   c) Structured d) above all
9. Which of the following is not the data collection technique?
   a) Questionnaire b) Social survey
   c) Focus group discussion d) Interview
10. Society and Technology are interrelated in the ear of.....
    a) Ancient period b) Medieval period
    c) Modern period d) Above all

Group B

Attempt any SIX questions. 6×5=30

11. How does Formalistic school of thought differ from Synthetic school of thought?
12. Write an essay on 'relevance of sociology in computer application.'
13. Discuss the influence of modern technology in changing family relationship
14. What do you understand by society? How does it differ from community? Discuss with examples.
15. What is marriage and what are the various types of marriage? Describe with examples.
16. What do you understand by social stratification? Discuss caste-based stratification in Nepalese society.
17. Write Short Notes on any two:
    a) Assimilation
    b) Discus Group Discussion method in social research
    c) Quantitative research

Group C

Attempt any TWO questions. 2×10=20

18. Define socialization and describe its stages and agents.
19. 'A greater proportion of an individual's personality is a reflection of the type of socialization process he or she has gone through during socialization.' Explain.
20. Do you think technology plays an important role in the development of society ? Explain.

MODEL SET 5

Group A

Attempt all the questions [1×10 =10]

Circle (O) the correct answer.

1. The father of Sociology is
    a) Talcott Parson
    b) Max Weber
    c) Karl Marx
    d) August Comte
2. Which of the following is not true?
    a) Sociology is the scientific study of society.
    b) Sociology is the holistic study of human culture.
    c) Sociology is a value-free science.
    d) Sociology contributes in social policy formulation and social planning.
3. What are the major two schools of thought related to scope of sociology?
    a) Formalistic school and Synthetic school of thought
    b) Critical and specialist school of thought
    c) Formalistic and critical school of thought
    d) American and British school of thought
4. Which of the following is not a unit of social life?
    a) Association
    b) Organization
    c) Group
    d) Social Conflict
5. One's father's brother is one's
    a) Fictive Kin
    b) Affinal Kin
    c) Consanguineal Kin
    d) All of the above

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6. The process by which individuals learn the culture of their society is known as
   a) Acculturation b) Assimilation
   c) Enculturation d) Accommodation
7. What is the process by which a society transmits its values to individuals so that they can function properly as its member?
   a) Personalization b) Internalization
   c) Socialization c) Generalization
8. Which of the following is not true?
   a) Techno-culture is diffused to fulfill the human needs.
   b) Cultural appropriateness based innovations are diffused from one place to another easily.
   c) Technology is often diffused from developing areas to developed ones.
   d) Cultural diffusion is the universal social process
9. Sociology traditionally relies mainly on
   a) Quantitative data b) Historical data
   c) Qualitative data d) All of the above
10. Which one of the following can be placed under the category of ascribed status?
   a) Caste b) Class
   c) An engineer d) Social reformer

Group B

Attempt any SIX questions **[6 × 5 =30]**

11. Define sociology and discuss its nature.
12. Show the similarities and differences between sociology and anthropology.
13. What are the major functions of family ?
14. Discuss the class based social stratification in Nepalese society.
15. What do you understand by social change ? Discuss some of the major factors of social change.
16. What is research proposal ? Formulate a research proposal with its major components.
17. Discuss the major concepts of research in social science research.

Group C

Attempt any TWO questions. **[2 × 10 = 20]**

18. What do you understand by National Integration? What are the major dimensions of National Integration? Discuss.
19. Discuss historical process of nationhood in Nepal.
20. Discuss the major data collection tools and techniques used n social research.

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