

B.Tech.
 (SEM II) EVEN SEMESTER
 MAJOR EXAMINATION 2018-2019
 Subject Name: Graph Theory

Time: 3 hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carry equal marks.

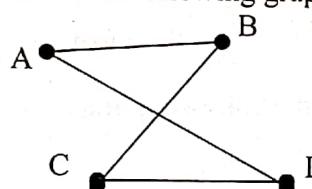
Q.1 Attempt any five parts of the following.

5x2=10

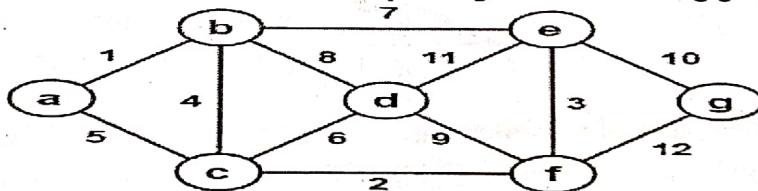
- (a) Use set builder notation and logical equivalences, establish the second De Morgan Law $\overline{A \cap B} = \bar{A} \cup \bar{B}$
- (b) Determine whether the graphs without self loops with these incidence matrices are isomorphic?

$$\begin{pmatrix} 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \end{pmatrix}$$

- (c) Using adjacency matrix, Determine total number of paths of length four are there from A to D in following graph.



- (d) Prove that in a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges.
- (e) Using Prim's algorithm, find minimum spanning tree of following graph.

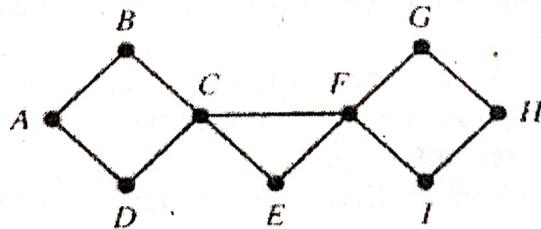


- (f) Explain union, ring sum, deletion and fusion operations in the graph with suitable example.
- (g) Prove that the number of labeled tree with n vertices ($n \geq 2$) is n^{n-2} .

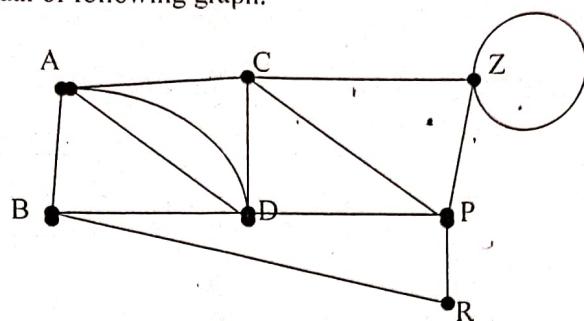
Q.2 Attempt any two parts of the following.

2x5=10

- (a) Explain Chinese postman problem with suitable example and using Fluery's algorithm, obtain an Eulerian circuit in the following graph.



- (b) Obtain geometric dual of following graph.

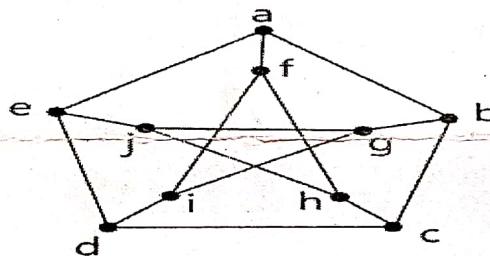


- (c) Prove that a connected graph G is an Euler graph if and only if all vertices of are of even degree.

Q.3 Attempt any two parts of the following.

2x5=10

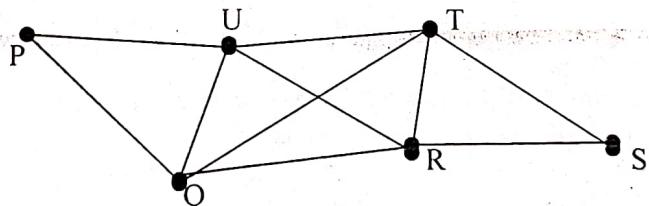
- (a) State and derive the Euler's formula for a planar graph.
- (b) Explain Traveling-Salesman problem with example and Prove that in a complete graph with n vertices have $(n - 1)!/2$ different Hamiltonian circuits, if n is an odd number ≥ 3 .
- (c) Using Kuratowski's theorem, Determine the following graph is planar or non planar.



Q.4 Attempt any two parts of the following.

2x5=10

- (a) Find chromatic polynomial of following graph.



- (b) Prove that a graph with at least one edge is 2-chromatic if and only if it has no circuit of odd length.
- (c) Prove that in every acyclic digraph G has at least one vertex with zero in-degree and at least one vertex with zero out-degree

Q.5 Attempt any two parts of the following.

2x5=10

- (a) Prove that a n -vertex graph is tree if and only if its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$.
- (b) Prove that every complete tournament has a directed Hamiltonian path.
- (c) Prove that a diagraph is acyclic if and only if its vertices can be ordered such that the adjacency matrix of the graph is an upper (lower) triangular matrix.

- (b) Explain run time polymorphism with suitable example.
- (c) Write a program in C++ for calling a virtual function through a base class reference. What is the need of pure virtual function?

4. **Attempt any two parts of the following:** $(2 \times 5 = 10)$

- (a) Create a generic function max that gives the maximum value of three generic type arguments that are passed to it. Test your function by calling it with char, int and float data type. What are the restrictions on generic function?
- (b) Write a program in C++ that takes date as input and throw an exception for invalid date. Make a class date having dd, mm and yy as data member.
- (c) Write a program in C++ that takes two integers as input from command line argument and print all the Fibonacci elements between these two numbers.

5. **Attempt any two parts of the following:** $(2 \times 5 = 10)$

- (a) List all the versions of "get" function used for file handling in C++. Write a program to show the usage of each of them.
- (b) There is a structure "person" having name, mobile and gender as data member. Assuming a file Pdetail has 100 such records. Write a program in C++ to read the given file and store the information in two separate file one containing only male records and other containing only female records.
- (c) Discuss in detail the key component of Standard Template Library.

BAS-08

Roll No. 2018021084

B. Tech.

Year: 1st Semester: 2nd

Major Examination: 2018-19

Engineering Physics-II

Note: Attempt all questions.

Q. 1	Attempt any five parts of the following:	5*2=10
a.	Define following terms- I- Unit Cell II- Primitive Cell III- Lattice Space IV-Crystal Structure	
b.	Define the term "Atomic Packing Fraction" and obtain it for a body centred cubic (bcc) lattice. What will happen, if the atom size composing the lattice is increased by 10 %?	
c.	Copper has a face centred cubic (fcc) structure. Its atomic radius is 1.278 \AA . If the atomic weight of copper is 63.5, calculate its density.	
d.	What are "Miller Indices"? What is their physical significance? In an orthorhombic crystal, a plane cuts intercepts of length $3a$, $-2b$ and $3c/2$ along three axes. Obtain Miller indices for the plane, if a , b and c are the primitive vectors of the unit cell.	
e.	A broad casting studio measuring $25 \times 12 \times 7$ meters has a reverberation time 0.78 second, when 250 audiences are sitting in it. Obtain the reverberation time when it is empty. Given that their absorption coefficient is 0.4 and the absorption area of each person is 0.6 m^2 .	
f.	Define the terms "Live Room" and "Dead Room" and obtain the formula for reverberation time of a dead room.	
g.	What do you mean by "Piezoelectric Effect". Briefly describe the production method of ultrasonic waves using it.	
Q. 2	Attempt any two parts of the following:	2*5=10
a.	Write down Maxwell's equations in Integral and Differential forms. Which laws of electrostatics do those represent and why? Explain it.	
b.	A spherical capacitor consists of a hollow spherical conductor of radius R_1 and surrounded by another concentric conductor of radius R_2 . If the inner sphere is given a charge $+Q$ and the outer sphere is given a charge $-Q$, using Gauss law of electrostatics, show that the capacitance of the spherical capacitor is given by $\frac{4\pi\epsilon_0 R_1 R_2}{(R_2 - R_1)}$.	
c.	Derive the formula for "Skin Depth" in conducting media for a good conductor and explain its physical significance.	
Q. 3	Attempt any two parts of the following:	2*5=10
a.	Derive Maxwell's fourth equation. Explain the physical significance of	

	displacement current density. Explain, why has Maxwell introduced it?	
b.	Using Maxwell's equations, prove that light is also an electromagnetic wave.	
c.	A plane electromagnetic wave has wavelength 6.0 cm. Its electric field component is oscillating in Y-direction with a maximum magnitude of 40 V/m. Write the equations for electric field and magnetic field as a function of position x and time t assuming that the wave is propagating along X direction.	
Q. 4	Attempt any two parts of the following:	2*5=10
a.	Explain the phenomenon of band gaps in solids. Discuss the case of Silicon and explain the electrical conductivity in metals, semiconductors and insulators.	
b.	What is superconductivity? How is it different from normal conductors? Explain superconductivity on the basis of BCS theory.	
c.	Obtain the formula for carrier charge density for intrinsic semiconductors	
Q. 5	Attempt any two parts of the following:	2*5=10
a.	Obtain London's equation for superconducting materials. How does it explain the Meissner Effect? Also define the term "Penetration Depth" using it.	
b.	Determine the transition temperature and critical field at 4.2 K for a given specimen of a superconductor if the critical fields are 1.40×10^5 and 4.12×10^5 amp/m at 13.8 K and 11.8 K respectively. 13.8 K	
c.	Why do the properties of materials change, when sizes are reduced to few tens of nanometers? Give five potential applications of nanomaterials.	

B. Tech.
EVEN SEMESTER
MAJOR EXAMINATION 2018 - 2019
Object Oriented Programming & C++

Time: 3 Hrs.**Max. Marks: 50****Note: Attempt all questions. Each question carries equal marks.**

- 1. Attempt any five parts of the following: $(5 \times 2 = 10)$**
 - (a) Define Metamodel. Illustrate the common usage of Metamodels.
 - (b) What do you understand by aggregation? Discuss the various types of aggregation by taking suitable examples.
 - (c) Discuss the constraints of inheritance based design.
 - (d) Draw a DFD for Library Management System. Make suitable assumptions.
 - (e) Write a function in C++ that takes an integer as input and makes it odd if the number is even and even if number is odd. Use call by reference mechanism.
 - (f) Write a program in C++ to show the usage of copy constructor. Why assignment operator is not used to copy one object into the other?
 - (g) Discuss the three usage of friend function. Elaborate any one usage.

- 2. Attempt any two parts of the following: $(2 \times 5 = 10)$**
 - (a) Design three classes student, test and result where result is inherited from test and test is inherited from student. Write possible functions to initialise the values. Also write a main function for execution by creating objects. Make and mention assumptions if required.
 - (b) Write a complete program in C++, that defines a class bank_account with current and saving account as inherited classes. Class bank_account should have following data members: Account_No, Name, Balance_amt and member functions: to initialize the value, to deposit and withdraw amount after checking the minimum balance.
 - (c) Write a program in C++ to implement array of objects, creating a class employee and accepting and displaying multiple dataset accepted by the user using array of objects.

- 3. Attempt any two parts of the following: $(2 \times 5 = 10)$**
 - (a) Write a program in C++ to overload “++” operator on a class employee having id, name and salary as field. When an object uses ++ operator the salary of employee increases by 10%. Use friend function for overloading

B. Tech.
EVEN SEMESTER
MAJOR EXAMINATION 2018 - 2019
Object Oriented Programming & C++

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- (g) Discuss the three usages of friend function. Elaborate any one usage.

2. Attempt any two parts of the following: (2× 5 = 10)

- (a) Design three classes student, test and result where result is inherited from test and test is inherited from student. Write possible functions to initialise the values. Also write a main function for execution by creating objects. Make and mention assumptions if required.
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B. TECH.
(SEM II) EVEN SEMESTER
MAJOR EXAMINATION 2018-2019

INDUSTRIAL PSYCHOLOGY

Time: 3 Hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carry equal marks.

1. Attempt any five parts of the following: (5 x 2 = 10)
 - (a) How do Equity theory and Expectancy theory explain Motivation?
 - (b) What purpose does Organizational Culture serve and how to create and sustain it?
 - (c) What are the properties of a group? Also explain, why do human beings form groups?
 - (d) What symptoms occur when a person is under stress? What strategies can be employed at the individual level to deal with stress?
 - (e) Briefly explain the extent of subject matter dealt by industrial psychology.
 - (f) Summarize the essential elements of Trait theories and behavioral theories of leadership.
 - (g) What is Job Satisfaction and how it is measured?

2. Attempt any two parts of the following: (2 x 5= 10)
 - (a) Why do industrial workers need healthy work environment? What are the factors that influence work environment?
 - (b) What are the various factors that influence the process of recruitment?
 - (c) Define Engineering Psychology and explain its objectives. What are the various methods used in Engineering Psychology research?

3. Attempt any two parts of the following: (2 x 5= 10)
 - (a) What are the parameters that determine the authenticity/ credibility of a psychological test?
 - (b) What standard process you would follow to compose the description and specification of a job?
 - (c) Define Recruitment and explain the rationale of conducting it. How would you go about conducting recruitment in your organization?

4. Attempt any two parts of the following: (2 x 5= 10)
 - (a) How an organization can maintain organization-job-employee characteristic match? Also, explain the 360° appraisal process.
 - (b) Critically evaluate the comparative methods of performance appraisal.
 - (c) Which methods of performance appraisal specify precise measurement standards?

5. Attempt any two parts of the following: (2 x 5= 10)
 - (a) Explain what is training and what is development? Do they differ? How?
 - (b) Explain the process of training and various methods of conducting it.
 - (c) How would you design an effective training programme? Explain.

A FET has driven current of 4 mA. If $I_{DSS} = 8\text{mA}$ and $V_{GS(\text{OFF})} = -6\text{V}$. find the values of V_{GS} and V_p .

(c) Why JFET is called voltage controlled device? Explain the operation of n-channel JFET with neat diagram. Draw it's characteristics with different regions of operation

3. Attempt any two parts of the following (2x5)=10

(a) Describe an OP-AMP. How OP-AMP can be represented in block diagram from. Write characteristics of an ideal OP-AMP. Define CMRR.

(b) Explain the operation of OP-AMP in non inverting mode with proper Circuit. Derive the expression for its gain. How it can be used as buffer? Write the applications of buffer circuit.

(c) Draw the circuit of an OP-AMP integrator and derive the expression for its output voltage in terms of input voltage.

4. Attempt any two parts of the following (2x5)=10

(a) Plot the logical expression.

$$ABCD + A\bar{B}\bar{C}D + \bar{A}\bar{B}C + AB$$

On a 4 variable K Map. Obtain the simplified expression from the map.

(b) Convert the following numbers as directed with procedures.

(i) $(4021.25)_{10} = (\quad)_{12}$

(ii) $(A6F.CD)_{16} = (\quad)_8$

(iii) $(2AC9)_{16} = (\quad)_7$

(iv) $(725.25)_{10} = (\quad)_{16}$

(v) $(7841)_9 = (\quad)_{10}$

(c) State and Prove following properties and laws of Boolean algebra.

(i) Distributive property

(ii) Consensus Laws

5. Attempt any two parts of the following (2x5)=10

(a) State the advantages of DVM over an analog meter. Explain the basic principle of DVM.

(b) Describe the Working of CRO with the help of block diagram. Mention the practical applications of CRO.

(c) Explain the operation of basic Digital Multimeter with block diagram. How current and resistance can be measured?

B. Tech. II Semester
EVEN SEMESTER
MAJOR EXAMINATION 2018 - 2019

Subject Name: Engineering Mathematics II

Max. Marks: 50

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks.

 $(5 \times 2 = 10)$

1. Attempt any five parts of the following:

- (a) Solve the differential equation

$$(D^2 - 4D - 5)y = xe^{-x}.$$

- (b) Solve the differential equation

$$x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x.$$

- (c) Solve the system of linear differential equation

$$\frac{d^2x}{dt^2} - 3x - 2y = 0; \quad \frac{d^2y}{dt^2} + x + y = 0.$$

- (d) Solve the differential equation

$$\frac{d^2y}{dx^2} + 4y = 4 \tan 2x$$

by using method of variation of parameters.

- (e) Find the power series solution of the equation

$$(x^2 + 1)y'' + xy' - xy = 0$$

in the powers of x .

- (f) Prove that
- $P_n(1) = 1$
- .

- (g) Prove that

$$J_{-\frac{1}{2}}(x) = \sqrt{(2/\pi x)} \cos x.$$

2. Attempt any two parts of the following:

 $(2 \times 5 = 10)$

- (a) Find the Laplace transform of the function
- $e^{kt}(at^2 + bt + c)$
- .

- (b) Find the Laplace transform of the function
- $e^{-t}(3 \sin 2t - 5 \cos 2t)$
- .

- (c) Find the Laplace transform of the function
- $\sinh at \cos at$
- .

3. Attempt any two parts of the following:

 $(2 \times 5 = 10)$

- (a) Evaluate

$$L^{-1} \left\{ \frac{6}{2s-3} - \frac{3+4s}{9s^2-16} + \frac{8-6s}{16s^2+9} \right\}.$$

- (b) Find the Laplace transform of the function
- $\text{erf}(\sqrt{t}) = \frac{2}{\sqrt{\pi}} \int_0^{\sqrt{t}} e^{-u^2} du$
- . Hence deduce
- $L\{t \text{erf}(\sqrt{t})\}$
- .

B. Tech.
Year 1st Semester 1st (ODD SEMESTER)
(ECE,EE & ME)

Major Examination 2018-2019

FUNDAMENTALS OF ELECTRONICS ENGINEERING

Time: 3 Hours

M.M.: 50

Note: - Attempt all the questions. Each question carries equal marks.

Attempt any Five parts of the following. (5x2) = 10

- (a) Give the classification of materials on the basis of Electrical behaviour. Explain each with the help of simple energy band diagram.
- (b) Draw V-I Characteristic curve of Si diode in forward and reverse bias. Write volt ampere equation and elaborate all terms used.
- (c) Determine the rating of a transformer to deliver 100 watts of d.c. power to a load under FWR Assume $V_{dc} = 10V$.
- (d) Discuss Early effect in transistor. Mention its consequences.
- (e) What are the advantages of h parameters for transistor amplifier analysis? Draw the small signal model of BJT amplifier using h parameters at low frequency in CE configuration.
- (f) Draw the circuit of zener diode voltage regulator with series resistance R_s , and load resistance $R_L = 120 \text{ ohm}$. Calculate the value of R_s if output is maintained at $V_Z = 6.2V$.
- (g) Write short notes on any two of the following.

- (i) Transition and diffusion capacitance of p-n junction
- (ii) Clipper circuits
- (iii) Voltage Doublers

the input voltage
varies from 20 to 40 volt
h_{QE} E h_{fe} S G

Attempt any two parts of the following. (2x5)=10

- (a) Why N channel MOSFETS are preferred over P channel MOSFETS? With the help of suitable diagram explain the working of P Channel DMOSFET. Indicate it's Characteristics.
- (b) Establish the relation

$$gm = g_{mo} \left(1 - \frac{V_{GS}}{V_p}\right)$$

where symbols have their usual meaning.

(c) Solve the differential equation

$$ty'' + y' + 4ty = 0, y(0) = 3, y'(0) = 0$$

by using Laplace transformation.

4. Attempt any two parts of the following:

(2× 5 = 10)

(a) Find the Fourier series for $f(x) = e^x$ in $(-\pi, \pi)$.

(b) Find the Fourier half range cosine series for $f(x) = x(\pi - x)$ in $(0, \pi)$.

(c) Find the Fourier half range sine series for $f(x) = \cos x$ in $(0, \pi)$.

5. Attempt any two parts of the following:

(2× 5 = 10)

(a) Solve the partial differential equation

$$(2D^2 - 5DD' + 2D'^2)z = 24(y - x), \quad D \equiv \frac{\partial}{\partial x}, D' \equiv \frac{\partial}{\partial y}.$$

(b) Solve the partial differential equation

$$r - 2s + t = \sin(2x + 3y)$$

(c) Solve the partial differential equation

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \cos mx \sin ny.$$

B.Tech
 (Semester II) EVEN SEMESTER
 MAJOR EXAMINATION 2018 - 2019

Fundamental of Electronics Engineering

Time: 3 Hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carry equal marks.

1. Attempt any five parts of the following:

(5 x 2 = 10)

- (a) Explain the effects of temperature variation on the V-I characteristics of a PN junction diode.
- (b) The reverse saturation current of a silicon PN junction diode is $10 \mu\text{A}$. Calculate the diode current for the forward-bias voltage of 0.6 V at 25°C .
- (c) Define static resistance and dynamic resistance of a PN junction diode.
- (d) Determine the value of dc resistance and ac resistance of a germanium diode at 25°C with $I_0 = 25 \mu\text{A}$ and at an applied voltage of 0.2 V across the diode.
- (e) Define α , β and γ in a BJT transistor.
- (f) Determine the values of I_C and I_B for the transistor circuit having $\beta = 100$ and $I_E = 12 \text{ mA}$.
- (g) Define the stability factor of a BJT transistor.

2. Attempt any two parts of the following:

(2 x 5 = 10)

- (a) Explain the construction and working of an enhancement type MOSFET.
- (b) Define transconductance (g_m), drain resistance (r_d), and amplification factor (μ) in a JFET. Also derive relationship among g_m , r_d , and μ .
- (c) Explain the construction and working of N-channel JFET.

3. Attempt any two parts of the following:

(2 x 5 = 10)

- (a) What are the characteristics of an ideal operational amplifier? Draw the block diagram of a typical operational amplifier.
- (b) Define the following:
 - i) Input offset current
 - ii) Input bias current
 - iii) Common mode rejection ratio
 - iv) Slew rate
- (c) Draw the inverting and non-inverting amplifier circuits of an op-amp in closed-loop configuration. Obtain the expressions for the closed-loop gain in these circuits.

4.

Attempt any two parts of the following:

(2 × 5 = 10)

(a) State and explain De Morgan's theorem. Prove De Morgan's theorem for a four variable function.

(b) Simplify the following by using K-map method.

$$i) Y(A,B,C,D) = \sum m(1,5,10,11,12,13,15)$$

$$ii) Y(A,B,C,D) = \sum m(1,3,7,11,15) + \sum d(0,2,5)$$

(c) Express the function $Y = A + B'C$ in i) Canonical SOP form and ii) Canonical POS form.

Attempt any two parts of the following:

(2 × 5 = 10)

(a) Explain the working principle of a digital voltmeter. Also write advantages of a digital voltmeter over an analog meter.

(b) Describe various parts of a Cathode Ray Tube (CRT). Explain how frequency can be measured by using a CRO.

(c) Draw the block diagram of a digital multimeter and explain its working principle.

1 - 1 $\frac{1}{\sqrt{n}}$ $\frac{1}{n}$ $\frac{1}{n^2}$ $\frac{1}{n^3}$