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Aliah University

End-Semester Examination (Autumn Semester) - 2019

(For 2<sup>nd</sup> Year 3<sup>rd</sup> Semester B.Tech (CSE))

Paper Name: Numerical Methods

Paper Code: CSE205

Full Marks: 80

Time: 3 hrs

**Group-A**

(Answer all questions)

$5 \times 2 = 10$

1. What is the condition for convergence and the order of convergence of the Newton-Raphson method?
- ✓ 2. Find the relative error in the computation of  $x-y$  for  $x=12.05$  and  $y=8.02$  having absolute errors  $\Delta x = 0.005$  and  $\Delta y = 0.001$ .
- ✓ 3. What is the difference between Interpolation and Extrapolation?
4. State two points Gaussian quadrature formulae.
- ✓ 5. Which method of iteration converges faster and why?

**Group-B**

(Answer any five questions)

$6 \times 5 = 30$

- ✓ 1. Give the geometrical interpretation of Trapezoidal Rule.
- ✓ 2. Give an algorithm for solving a non-linear equation using the Method of Bisection.
- ✓ 3. State Newton's forward formulae and backward formulae for equal intervals. Construct a difference table for  $y=x^3 + 2x + 1$ , for  $x=1,2,3,4,5$ .
- ✓ 4. Compute  $y(0.4)$  from the equation  $\frac{dy}{dx} = x - y$ ,  $y(0) = 1$ , taking  $h=0.1$ , by 2<sup>nd</sup> order Runga-Kutta method, correct to five decimal places.
5. Derive Gauss-Legendre Quadrature Formula for equidistant ordinates.
6. Interpret Newton Raphson method geometrically.

**Group C**

(Answer any four questions)

$4 \times 10 = 40$

- ✓ 1. Find the value of  $\int_0^1 \frac{dx}{1+x^2}$ , taking 5 sub-intervals, by i) Trapezoidal Rule ii) Simpson's 1/3<sup>rd</sup> rule, correct to 5 significant figures.  
Also compare it with its exact value.

$5+5=10$

- ✓ 2. a) Compute one positive root of  $2x-3\sin x-5=0$ , by the Method of Bisection. 2-9

- b) Compute the root of the equation  $2x-\log_{10}x - 7=0$ , by Regula-Falsi method, which lies between 3 and 4, correct to three decimal places.

$5+5=10$

- ✓ 3. Compute  $y(0.8)$ , by using 4<sup>th</sup> order Runga-Kutta method correct to five decimal places from the equation

$$\frac{dy}{dx} = xy, y(0) = 2, \text{ taking } h = 0.2$$

10

4. a) Derive a formula to find the value of  $\sqrt{N}$  where N is a real number using Newton's method. Using this method compute  $\sqrt{27}$  correct to six decimal places.

- b) Using Euler's Method, find  $y(0.1)$ , given that  $\frac{dy}{dx} = \frac{y-x}{y+x}$ ,  $y(0) = 1$  correct up to four decimal places, taking step length  $h=0.02$

- ✓ 5. a) Find the positive root of  $x^3-x-0.1=0$  by Newton-Raphson Method correct to six significant figures.

$5+5=10$

- b) Given the following table, compute  $f(0.39)$  by any suitable Interpolation method.

x :	0.30	0.32	0.34	0.36	0.38	0.40
$f(x)$ :	1.7596	1.7698	1.7804	1.7912	1.8024	1.8139

7+3=10

ALIAH UNIVERSITY

AUTUMN SEMESTER EXAMINATION - 2019

B. Tech (Semester -III), 2<sup>nd</sup> Year

Discrete Mathematics

MA237

(M11)

f f T  
F  
T T F

Full Marks - 80

Time - 3 Hrs.

Group - A

Answer any ten :-

10x1=10

Write down a relation on R so that the relation is reflexive, symmetric but not transitive.

Define binary relation

Write down the truth table for NAND Statement  $p \uparrow q$

State the pigeon hole principle.

Simple graph has

- a) no parallel edges      b) no loops      c) no parallel edges and no loops      d) no isolated vertex

i) The vertex set of a null graph is

- a) empty set      b) non-empty set      c) single ton set      d) none of these

vii) Choose the correct statement

- a) path is an open walk      b) every walk is a trail      c) every trail is a path

d) a vertex cannot appear twice in a walk

viii) Tree is a connected graph without any

- a) Pendant vertex      b) circuit      c) Odd vertex      d) even vertex

ix) The root of a binary tree is the vertex having degree

- a) 1      b) 2      c) 3      d) 4

x) What is the definition of chromatic number and chromatic index.

xii) A graph consisting of only isolated vertices is

- a) 1 chromatic,      b) 2 Chromatic      c) n - Chromatic      d) none

GROUP - B

any six :-

6x5=30

Let Z be the set of integers. Define a relation R on Z such that  $x R y$  holds if and only if  $x - y$  is divisible by 5,  $x \in Z, y \in Z$ .

Show that R is an equivalence relation.

1) If  $f: R \rightarrow R$  is defined by  $f(x) = x^2 - 3x + z$  find  $f(f(x))$

If the function  $f: R \rightarrow R$  be given by  $f(x) = x^2 + 2$  and  $g: R \rightarrow R$  be given  $g(x) = \frac{x}{x+1}$ , find  $fog$

2+3

4) Prove that  $p \wedge (q \wedge r) \Leftrightarrow (p \wedge q) \wedge r$  is a tautology.

5

5. How many numbers are there between 100 and 1000 which have exactly one of their digit 7?

5

6) Use mathematical induction to show that

$$2+4+6+\dots+\dots+2n = n^2 + n$$

5

7. If the two numeric functions are given by

$$a_r = 0, 0 \leq r \leq 4 \quad 2^{-r} + 3, r \geq 5$$

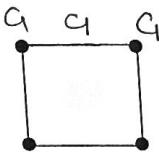
(2+3)

$$b_r = 1 - 2^r, 0 \leq r \leq 2 \quad 2^r + 2, r \geq 3$$

Find  $c_r, d_r$  where  $c_r = a_r + b_r, d_r = a_r \cdot b_r$

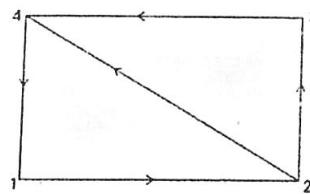
8. i) Write down the watch-powell algorithm to find the chromatic number.

ii) Find the chromatic number of the graph.



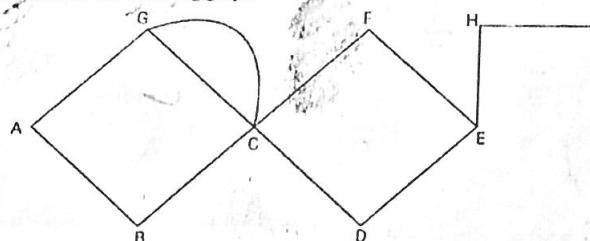
(3+2)

✓ i) Find the adjacency matrix of a directed simple graph.



5

II) find the spanning tree by Depth - first method of the following graph.



5

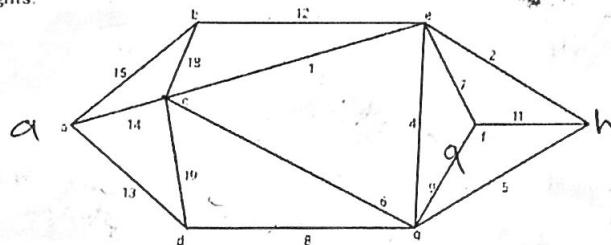
✓ 10. i) Express the following expression by a binary tree  $(2x + y) * (5a - b)^3$

5+5

✓ ii) Write down Kruskal's Algorithm for a minimal spanning tree of any graph G.

✓ 11. i) Using Kruskal's algorithm find a minimal spanning tree for the following graph listing all edges of G in order of non-decreasing weights.

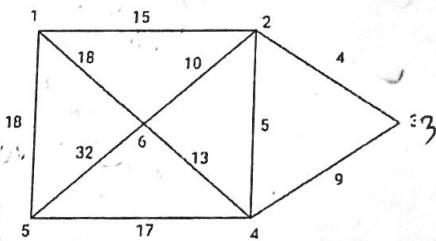
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ii) Using Prim's Algorithm find the minimal spanning tree (justifying the arguments)

5

30



12. i) Solve the difference equation :-

$$a_{n+2} - 3a_{n+1} + 2a_n = 0 \text{ with the following condition } a_0 = 2, a_1 = 3$$

6

ii) Prove by the method of induction that square of every odd number greater than 1, when divided by 8 leaves 1 for a remainder.

4

✓ 13. i) Find the solution of the difference equation.

6

$$a_{r+2} - 2a_{r+1} + a_r = 3r + 5$$

✓ ii) Determine the generating function of the following numeric function :-

4

$$a_r = 2r + 3, \quad r = 0, 1, 2, \dots$$

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# Aliah University

## End-Semester Examination (Autumn Semester) - 2019

(For 2<sup>nd</sup> Year, 3<sup>rd</sup> Semester B.Tech (CSE))

Paper Name: Digital logic

Full Marks: 80

Paper Code: CSE203 Time: 3 hrs

Time: 3 hrs

### Group-A

(Answer any 10 questions)

$10 \times 1 = 10$

Even & odd code

Which code is called non-weighted code? Which code is called self-complementing code?

Reduce the expression  $f = \overline{AB} + \overline{A} + AB$ .

When even number of NOT gates/inverters is connected in feedback, it acts like a ring inverter.

Multivibrator.

Convert NAND gate to OR gate.

Designing a 4-bit Comparator combinational circuit, the combination that gives high output (i.e. A>B) is \_\_\_\_\_.

To design 16x1 Multiplexer, how many AND gate and NOT gate is required?

A 6-bit Ring Counter is operated with 240 KHz clock. Calculate the number of unused state and output frequency.

To design MOD-98 counter, how many flip-flop is required and how many input of a NAND gate is required?

In which type of triggering the race around condition is occurred in a flip-flop?

- Which one is from bipolar unsaturated logic family-(i)DTL (ii)TTL (iii)ECL (iv) CMOS.
- The basic DTL circuit act as which gate- (i) AND (ii) NAND (iii) NOT (iv) NOR?
- Among the following logic families, the one having the lowest power dissipation and highest power noise margin is- (i) Schottky TTL (ii) TTL (iii) ECL (iv) CMOS

### Group-B

(Answer any six questions)

$6 \times 5 = 30$

What is Parity code and why it is used? Define Hamming code? Convert the Decimal number 17 to Gray code.  $2+2+1=5$

Add (-75) and (+26) using the 8-bit 2's complement arithmetic. Subtract BCD number 81.2 from 98.3 using 9's complement.  $2+3=5$

Define Disjunctive Canonical Form (DCF) and Disjunctive Normal Form (DNF). What is maxterm? Expand  $f = A(\overline{B} + A)B$  to maxterms and minterms.  $2+1+2=5$

Define Prime Implicant and Essential Prime Implicant. Find the minimal expression using k-map (i)  $f = \sum m(0,1,2,3,5,7,8,9,10,12,13)$  (ii)  $f = \sum m(1,5,6,12,13,14) + \sum d(2,4)2+1.5+1.5=5$

Write a short note on Look-ahead Carry Adder. Write the application of Comparator.  $4+1=5$

Implement and design the multiplexer  $f = \sum m(1,2,4,6)$ . Write the difference between Latch and flip-flop. How many number of selection line is required for designing  $1 \times 256$  Demultiplexer.

$2+2+1=5$

✓ 1. Implement the excitation table for S-R flip-flop and J-K flip-flop. What is CLEAR and PRESET? (2+2)+1=5

8. Define the characteristics of logic family **Fan-in** and **Tri-state logic**. Design the circuit diagram of Resistor Transistor Logic (RTL) 2-input NOR gate and implement the truth table also. 3+2=5

✓ 9. Write short note (any two): (i) ROM (ii) Programmable Logic Array (PLA) (iii) PMOS & NMOS Inverter (iv) CMOS as NAND gate. 2×2.5=5  
20

**Group-C**  
**(Answer any four questions)**

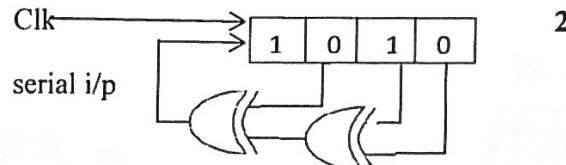
**4 × 10 = 40**

✓ 1. Reduce following expression  $f(A, B, C, D) = \sum m(0, 1, 3, 7, 8, 9, 11, 15)$  using Quine-Mccluskey Minimization technique and identify the Prime Implicant (PI), Essential Prime Implicant(EPI).  
Prove that (i)  $f = A[B + \bar{C}(AB + A\bar{C})] = AB$  (ii)  $f = A\bar{B}C + B + B\bar{D} + AB\bar{D} + \bar{A}C = B + C$ . Convert the decimal number (23) to Excess-3 code number. 5+2+2+1=10

2. Define **2×4 Decoder** and implement the truth table & circuit diagram also. Explain **FullAdder** with Truth table and circuit diagram. Convert  $2\times 1$  Multiplexer to AND and OR gate. 3+4+(1.5+1.5)=10

✓ 3. What is race around condition and how to overcome this problem, explain with circuit and timing diagram? Brief description of Serial in Serial out (SISO) Shift Register with the help of circuit diagram and truth table. Write the application of shift register. (3+3)+3+1=10

✓ 4. The shift register shown in fig. is initially loaded with the bit pattern 1010. Subsequently the shift register is clocked, and with each clock pulse the pattern gets shifted by one bit position to the right. With each shift, the bit at the serial input is pushed to the left most position (MSB). After how many clock pulses will the content of the register become 1010 again.



What are the application of Ring Counter. Design a 3-bit up synchronous counter. 2+5

To design asynchronous counter that counts the sequence 0-1-2-1-3-1 and repeats. The minimum number of J-K flip-flop required implementing this counter is \_\_\_? 1

✓ 5. Write short note (any two): (i) Universal shift register, (ii) Priority encoder, (iii) MOD-6 UP asynchronous counter, (iv) Johnson counter (v) Full Subtractor 2×5=10

✓ 6. Compare between Moore Model and Mealy Model. Implement the state diagram for J-K flip-flop. Explain open collector TTL. 2+2+6=10

**ALIAH UNIVERSITY**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**  
**B. TECH. (CSE), SEM. - III**  
**END TERM EXAMINATION, (Reg/Sup), Autumn - 2019**  
**CIRCUIT THEORY & NETWORKS(OEE201/EE231)**

**TOTAL MARKS: 80**

**TIME: 3 HOURS**

**INSTRUCTIONS:-**

1. Mention the question number clearly. Answer all parts of a question at single location.
2. Draw circuit & waveforms wherever necessary.
3. Acronyms & symbols have their usual meaning unless otherwise specified.
4. Make suitable assumptions wherever necessary.

**GROUP – A (Multiple Choice Type Questions)**

**Que-1      Answer any ten questions. [10x1=10]**

- (i) Kirchhoff's voltage law is based on principle of conservation of  
 energy (B) momentum (C) mass (D) charge
- (ii) If a function  $f(t)$  is shifted by  $T$ , it is correctly represented as  
 (A)  $f(t-T)u(t)$      (B)  $f(t-T)u(t-T)$     (C)  $f(t)u(t-T)$
- (iii) The unit step  $u(t)$  is not defined at  $t_0$ , where  $t_0$  is equal to  
 (A) 0    (B) 1    (C)  $\infty$     (D) -1
- (iv) The Laplace transformation of a shifted step  $f(t)=u(t-a)$  is  
 (A)  $e^{-as}$      (B)  $\frac{e^{-as}}{s}$     (C)  $se^{-as}$     (D)  $s(1-e^{-as})$
- (v) In Superposition theorem, while considering a particular source, all other voltage sources are?  
 (A) open circuited (B) short circuited (C) changed its position  (D) removed from the circuit
- (vi) A practical current source can also be represented as  
 (A) a resistance in parallel with an ideal voltage source (B) a resistance in parallel with an ideal current source (C) a resistance in series with an ideal current source (D) none of the mentioned
- (vii) With some initial charge at  $t = 0+$ , a capacitor will act as  
 (A) open circuit (B) short circuit (C) a current source  (D) a voltage source
- (viii) A voltage source with an open circuit voltage of 200 V and internal resistance of  $50\Omega$  is equivalent to a current source of  
 (A) 4A with  $50\Omega$  in parallel (B) 4A with  $50\Omega$  in series (C) 0.5A with  $50\Omega$  in parallel
- (ix) In a network consisting of linear resistors and ideal voltage source, if the value of resistors are doubled, then voltage across each resistor will  
 (A) increase four times  (B) remain unchanged (C) get doubled (D) get halved
- (x) Two networks are connected in series parallel connection. Then, the forward short-circuit current gain of the network is  
 (A) Product of Z-parameter matrices (B) Sum of h-parameter matrices (C) Sum of Z-parameter matrices  (D) Product of h-parameter matrices
- (xi) For a 2 port network, the transmission parameters are given as 10, 9, 11 and 10 corresponds to A, B, C and D respectively. The correct statement among the followings is?  
 (A) Network satisfies both reciprocity and symmetry (B) Network satisfies only reciprocity  
 (C) Network satisfies only symmetry (D) Network satisfies neither reciprocity nor symmetry
- (xii) The relation  $AD - BC = 1$ , (where A, B, C and D are the transmission parameters of a network) is valid for  
 (A) Both active and passive networks (B) Passive but not reciprocal networks  
 (C) Active and reciprocal networks (D) Passive and reciprocal networks

9  
10  
11  
 $10 + 9 = 19$

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GROUP – B (Short answer Type Questions)

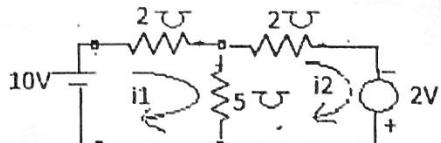
Answer any 2 questions from Que-2 to Que- 4 (2 X 5 = 10 Marks)

10 + 10 = 20

Que-2

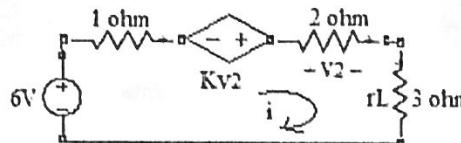
Determine the current in the conductance of  $5\text{ }\Omega$  of the network shown in the following figure using mesh current analysis.

Ans:  $\frac{3}{2}$



Que-3

For the circuit shown in fig. find the voltage drops across  $r_L$  if  $K=4$ .



Que-4

Compute the  $\vartheta(t)$  when  $V(s) = \frac{2}{s^3 + 12s^2 + 36s}$

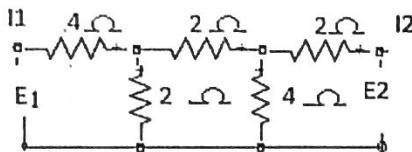
GROUP – C (Long answer Type Questions)

Answer any 4 questions from Que-5 to Que- 9 (4 X 15 = 60 Marks)

Que-5 (A)

The  $h$ -parameters for a two-port network are defined by  $\begin{bmatrix} E_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} \begin{bmatrix} I_1 \\ E_2 \end{bmatrix}$ , for the two-port network shown in the fig. Find the value of all parameters. Show that the given circuit is reciprocal or symmetrical or none of them.

[8]



(B) Derive the transmission parameters in term of admittance parameters.

T + 0 X

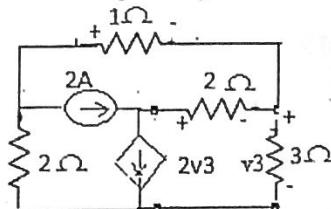
[7]

Show that  $A=D$  for transmission two –port network to be symmetrical.

Que-6 (A)

Find the mesh currents and determine various node voltages in the circuit shown in figure. Also calculate the power dissipated by  $3\Omega$  resistor.

[8]

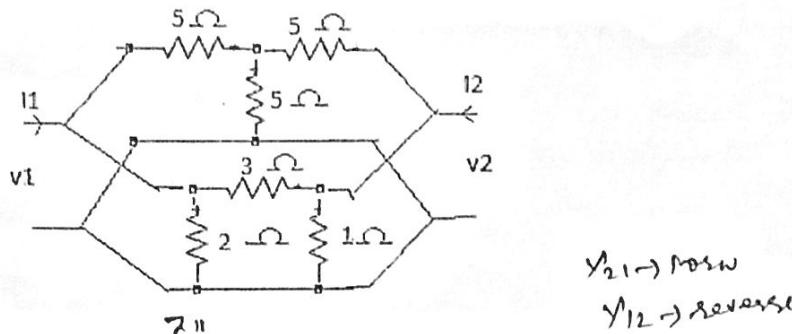


(B) State Superposition theorem. Draw a suitable circuit diagram and prove that theorem.

[7]

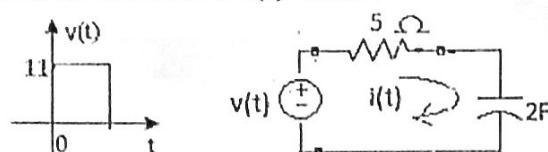
Que-7 (A) Find the admittance parameter of the network shown in fig.

[8]

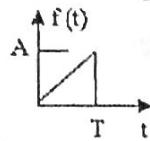


- (B) Find out the driving-point impedance parameter and reverse transfer impedance parameter from the general equation of two-port open circuit Network and draw the corresponding one-generator equivalent circuit. [7]

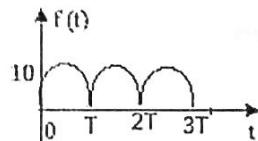
Que-8 (A) The voltage pulse  $v(t)$  is applied to the circuit in fig . with zero initial condition .Find the current  $i(t)$  and sketch the waveform of  $i(t)$  versus  $t$  [8]



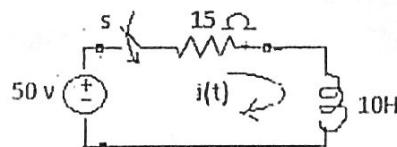
- (B) A sawtooth pulse is shown in the fig. Write the expression of the function  $f(t)$ . [7]



Que-9 (A) Determine the Laplace transform of the periodic half sine wave as shown in the fig. [8]



- (B) Assuming zero initial condition find the transient response of the current in the circuit shown in fig [7]



# Aliah University

## End-Semester Examination (Autumn Semester) - 2019

(For 2<sup>nd</sup> Year 3<sup>rd</sup> Semester B.Tech (CSE))

Paper Name: Data Structure & Algorithm

Full Marks: 80

Paper Code: CSE201

Time: 3 hrs

### Group-A (Answer all questions)

$10 \times 1 = 10$

- ✓ 1. Differentiate linear and non-linear data structure?
- ✓ 2. "Data types are data structure" – is it true?
- ✓ 3. Give example of use of stack in computer science. *No not*
4. Prove that:  $3n + 2 = \text{Big-oh } (n)$
- ✓ 5. What do you mean by self-referential structure? Give example.
6. Give example of a non-comparison based sorting algorithm.
7. If the sequence of operations push(1), push(2), pop, push(1), push(2), pop(), pop(), push(2), pop() are performed on a stack then what will be the sequence of popped out values?
8. The way a card game player arranges his cards as he picks them up one by one is an example of which sorting technique?
9. What do you mean by abstract data type?
10. A complete Binary tree with 13 nodes is given. Find out the highest level of this tree.



### Group-B Answer any six questions)

$6 \times 5 = 30$

- ✓ 1. What do you mean by time complexity of an algorithm? Calculate the time complexity of a linear search algorithm for average case scenario. *2+3=5*
- ✓ 2. Write overflow and underflow conditions for a stack. Write the PUSH() and POP() algorithm for stack. *2+3=5*
- ✓ 3. Write the recursive binary search algorithm. *5*
- ✓ 4. Write an algorithm to merge two sorted sub-arrays. Compute the time complexity of the merge algorithm. *3+2*
- ✓ 5. Following two traversal sequences are given. Construct the corresponding Binary Tree: *5*  
Inorder: A / B \* C \* D+ E, Preorder: + \* \* / A B C D E
6. Why Bubble sort algorithm is so called? Calculate the time complexity of Bubble sort algorithm. *1+4=5*
- ✓ 7. Define binary search tree. Give example with some nodes with integer values. Show the preorder, inorder and postorder traversal output of the same. *1+1+3*

### Group-C (Answer any four questions)

$4 \times 10 = 40$

1. What is Linked list? Give some examples of linked lists. Write an algorithm for inserting a node at the beginning of a Linked list. Define Recursion. Write a recursive algorithm to solve the Tower of Hanoi problem. *2+4+4*
- ✓ 2. Compare between stack and queue with respect to their usage in computer science. How linked list is different from array? Write an algorithm to search an element from singly linked list. Evaluate the following expression using stack: 5, 6, 2, +, \*, 12, 4, /, - *1+2+4+3*
- ✓ 3. Explain the concept of Divide and Conquer algorithm designing technique with a suitable example. Write the algorithm for Quick Sort. *2+8*
4. Write insertion sort algorithm. Why it is so called? Compute its time complexity. Discuss about different memory representations of binary tree. *5+5*
5. Write short notes (any two): *5+5*  
(a) Comparison and non-comparison based sorting algorithms, (b) Graph traversal algorithms, (c) Binary search using linked list – feasible or not?

Stack  
It is a LIFO Data St.  
A Stack is a conceptual SA.  
consisting of a set of homogeneous  
alone and is based on the last-in-first-out  
LIFO:- ↘

Queue  
Queue is an very important data A.  
which can be used extensively in computer  
application of a PIPES data. in which  
the elements that are inserted first are  
to leave and to be taken out

**Group-A****Answer any two questions** $10 \times 2 = 20$ 

1. Write the full text of the preamble of the Constitution of India. 10
2. "India, that is Bharat shall be a Union of States" (Article 1(1) of the Constitution of India)-Explain. 10
3. What are the fundamental rights and the restrictions imposed upon these rights as described in part III of the Constitution of India. 5+5
4. Critically examine the procedure of the amendment of the Constitution of India as described in Article 368 of Part XX of the Constitution. 11

**Group-B****Answer any four questions**

5. Write down the fundamental duties of every citizen of India as laid down in Article 51A of Part IV A of the Constitution of India.
6. What are "Four Pillars" of India's Democracy?
7. Describe in brief the composition of Indian Parliament.
8. How is the president of India elected?  
Or  
Write five functions of the Prime Minister of India.
9. Write in brief the relation between the Governor of a State and the Chief Minister of a State 5
10. Write a brief note on the role of the Supreme Court of India in Indian Constitutional System 5