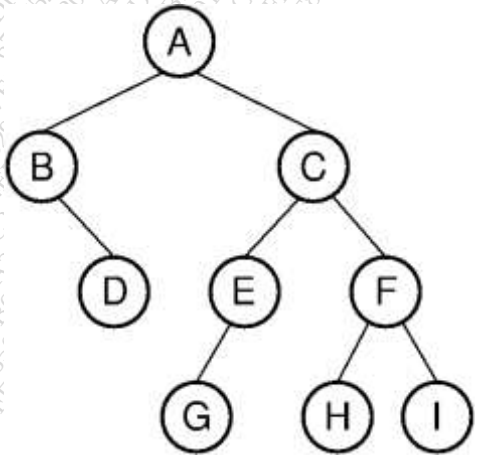
Q.P.Code:21841

(3 Hours) **[Marks: 80]**

N.B.: 1) Question No. 1 is compulsory.
2) Answer any three out of remaining questions.
3) Assume suitable data if necessary.
4) Figures to the right indicate full marks.

1.	(a)	Translate the given infix expression in to equivalent postfix expression. (a+ b*c-d)/(e*f)	3
	(b)	Explain linear and non linear data structures.	3
	(c)	What is depth, height and degree of Binary tree.	3
	(d)	What are the different ways to represent a graph?	2
	(e)	What is linked list? Explain types of linked list.	3
	(f)	What is recursion? State its advantages and disadvantages.	3
	(g)	Explain asymptotic notations.	3
2.	(a)	Write an algorithm for implementing queue using array.	10
	(b)	Write an algorithm for merge sort and comment on its complexity.	10
3.	(a)	Explain BFS and DFS algorithm with examples.	10
	(b)	Traverse the following binary tree into preorder, inorder, postorder by giving its algorithm.	10



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4. (a) What is Doubly Linked List? Write an algorithm to implement following operations on Doubly linked List. 10
(1)Insertion(All cases)
(2)Traversal(Forward and Backward)

(b) What is collision? What are the methods to resolve collision? Explain Linear probing with an example. 10

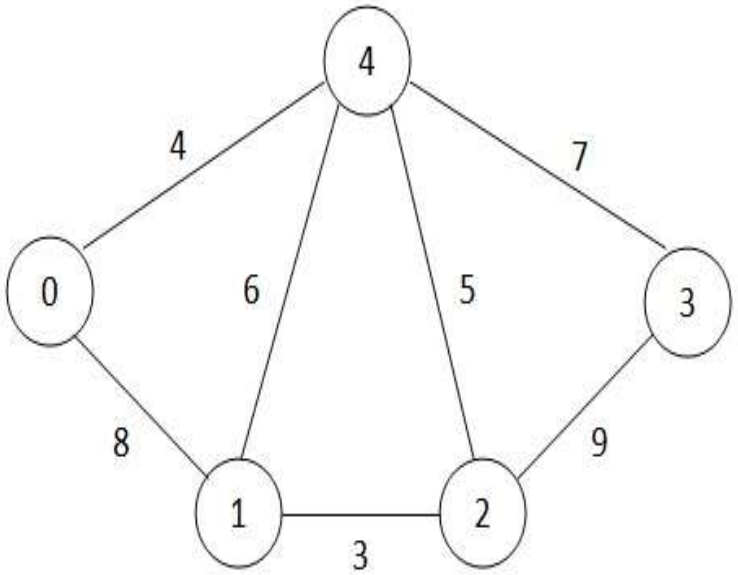
5. (a) What is Binary search tree. Construct Binary search tree for following elements: 10

13, 3, 4, 12, 14, 10, 5, 1, 8, 2, 7, 9, 11, 6, 18

(b) Explain Heap sort using an example. Write algorithm for it and comment on its complexity. 10

6. (a) Write an algorithm for implementing stack using array. 10

(b) What is Minimum Spanning Tree? Draw the MST using kruskal's and prim's algorithm and find out the cost with all intermediate steps. 10



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(Time: 3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Solve any **three** questions out of remaining **five.**
(3) Figures to **right** indicate **full** marks.
(4) Assume suitable **data** where **necessary.**

Q1. Solve any four 20
a) Explain DC operating point and its variation with the help of output characteristics of transistor.
b) Convert S-R flip flop to J-K flip flop.
c) Design Ex-OR gate using NAND and NOR gates.
d) Design full substractor using half substractor and additional gates.
e) Convert following decimal number to Binary ,Octal, Hexadecimal and Gray code
i) $(345)_{10}$ ii)$(818)_{10}$

Q2. a) Explain collector to base bias Circuit with its stability factor. 10
b) Minimize the following four variable logic function using K-map and Design using only NAND gates. 10

$f(A,B,C,D)=\sum m\ (0,1,2,3,5,8,9,10,11,12,14)$

Q3. a) Design 4-bit binary to gray code conversion using basic gates. 10
b) i) Implement following using only one 8:1 Multiplexer and few gates.

$F(A,B,C,D)= \sum m(1,3,4,5,8,9,12,15)$

ii) With neat logic diagram explain in short operation of Universal Shift Register. 10

Q4. a) Design a Mod 10 synchronous counter using J-K Flipflop. 10
b) Using Quine MC Cluskey Method determine Minimal SOP form for 10

$F(A,B,C,D)= \sum m(0,1,2,5,6,7,8,9,10,14)$

Q5. a) Explain about ENTITY declarations in VHDL and write VHDL program for NAND and OR gates. 10
b) Implement 3 bit asynchronous u p counter and also sketch the timing diagram. 10

Q6 Solve the following- 20
a) Explain working of 8:1 Multiplexer.
b) Working of S-R flip flop(with its internal circuit diagram and truth table).
c) Explain working of Constant Current source.
d) Write VHDL program for full substractor.

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Total Marks: 80 **Hours: 3 hrs**

Note : 1) Question no. 1 is compulsory.
2) Attempt any three questions out of five questions

Q-1

a) If any 11 numbers between 1 and 20 are chosen show that at least two of them will be multiplies of each other. **(05)**

b) A function $f: R-\left\{\frac{7}{3}\right\} \to R-\left\{\frac{4}{3}\right\}$ is defined by $f(x)=\frac{4x-5}{3x-7}$, Prove that f is bijective and find the rule for f^{-1}. **(05)**

c) Find $L\left[\frac{d}{dt}\left(\frac{1-\cos 2t}{t}\right)\right]$ **(05)**

d) Prove that there does not exist an analytic function whose imaginary part is $3x^2+\sin x+y^2+5y+4$. **(05)**

Q-2

a) Find $L^{-1}\left[\frac{s}{\left(s^2+3^2\right)\left(s^2+5^2\right)}\right]$ using convolution Theorem. **(06)**

b) What is the chance of throwing ten with four dice? **(06)**

c) In a certain examination there are multiple choice questions. There are four possible answers to each questions and one of them is correct. An intelligent student can solve 90% questions correctly by reasoning and for the remaining 10% questions he gives answer by guessing. A week student can solve 20% question correctly by reasoning and for the remaining 80% questions he gives answer by guessing. An intelligent student gets the correct answer. What is the probability that he was guessing. **(08)**

Q-3

a) A can hit a target 2 times in 5 shots, B 3 times in 4 shots, C 2 times in 3 shots. They fire a volley. What is the probability that at least 2 shots hit the target? **(06)**

b) Find $L^{-1}\left(\tan^{-1}\left(\frac{2}{s^2}\right)\right)$ **(06)**

c) If R is the relation on the set of integers such that aRb if and only if 2a+3b is divisible by 5. Find the equivalence classes. **(08)**

Q-4

a) Evaluate $\int_{t=0}^{\infty} e^{-3t}\left(\frac{\cos(7t)-\cos(11t)}{t}\right)dt$ **(06)**

b) Find $L^{-1}\left[\frac{s^2+2s+3}{\left(s^2+2s+10\right)\left(s^2+2s+17\right)}\right]$ **(06)**

c) Find the bilinear Transformation which maps the points $2, i, -2$ on to the points $1, i, -1$. Also find image of $|z|=1$ of z-plane to w-plane. **(08)**

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Q-5

a) A family consisting of an old man, 6 adults and 4 children is to be seated in a row for dinner. The children wish to occupy two seats at each end and the old man refuse to have a child on either side of him. In how many ways can the seating arrangement be made for the dinner? **(06)**

b) Find the analytic function $f(z) = u + iv$ in terms of z if $u - v = (x - y)(x^2 + 4xy + y^2)$. **(06)**

c) Solve $\frac{d^3y}{dt^3} - 2\frac{d^2y}{dt^2} + 5\frac{dy}{dt} = 0$ with y(0) = 0, y '(0) =0, y" (0) = 1. **(08)**

Q-6

a) Prove that $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$ **(06)**

b) Draw the Hasse diagram of D_{105}. **(06)**

c) Find Laplace Transformation of the following

i) $te^{3t} erf\left(5\sqrt{t}\right)$,

ii) $\sin t H(t) + (\cos t - \sin t) H(t - \pi)$ **(08)**

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(Time: 3Hours) **Marks: 80**

Note: 1) Question no. 1 is compulsory.
2) Solve any three out of remaining five questions.
3) Assume suitable data wherever necessary.

Q.1. a) Define Generalization and Specialization. 5
b) Compare the traditional file system with Database. 5
c) What are the different aggregate functions used in SQL? Explain with the help of examples. 5
d) Explain triggers with examples. 5

Q.2. a) Consider the following schema for institute Library. 10
Student (Rollno, Name, Father_name, Branch)
Book (ISBN, Title, Author, Publisher)
Issue (Rollno, ISBN, Date_of_Issue)
Write SQL queries for the following statements
i. List Roll Number and Name of all students of the branch CSE.
ii. Find the name of students who have issued a book published by 'ABC' publisher.
iii. List title of all books and their author issued by student 'Prashant'
iv. List title of all books issued on or before 1st JAN 2014
b) Explain the operation on files. 10

Q.3. a) Define normal forms and explain with suitable example First, Second and Third normal forms. 10
b) Discuss the basic operations that can perform using relational algebra. 10

Q.4. a) Define the following terms 10
i. Nested Queries
ii. DBA
b) Consider a relation R with five attributes ABCDE. You are given the following dependencies:
A→B BC→E ED→A 10
i. List all keys for R
ii. Is R in 3NF
iii. Is R in BCNF

Q.5. a) Discuss the different security and authorization mechanisms in Database Management System. 10
b) What is SQL Indexes? Explain types of Indexes with examples. 10

Q.6. a) Define Key Constraints and Referential Constraints. Explain the concept of foreign key with example. 10
b) Define the following terms 10
i. Weak Entity Set
ii. Total Participation
iii. Partial Participation
iv. Entity Type

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Duration: 3 Hours **Marks: 80**

N.B (1) Question No. 1 is compulsory
(2) Out of remaining questions attempt three
(3) Figures to right indicate full marks.

Q1) Solve any **four** **20 (5*4)**

a) With the help of typical values ,state various RF bands along with their Applications.
b) State Friiss formula & hence determine the overall noise figure in a two Stage cascaded amplifier if each stage has a gain of 10 dB along with a noise figure of 3 dB. **(1+4)**
c) Define Image frequency of AM receiver & hence calculate image frequency Of AM superheterodyne receiver with RF & IF frequencies of 600 KHz & 455 KHz respectively. **(1+4)**
d) Compare PAM, PWM & PPM system.
e) Define the following
(i) Quantization noise (ii) line coding process (iii) inter symbol interference
(iv) Bit rate (v) Baud Rate
f) Explain ground wave propagation in brief

Q2 a) Explain following in relation to radio receiver with suitable figure
1) Selectivity (2) sensitivity (3)double spotting (4) fidelity **(10)**
b) Explain the principal of TDM with neat diagram. Also explain need of synchronization in TDM. **(10)** **6+4**

Q3 a) What are different sources of noise? Classify & explain various noises that affect Communications. **(10)**

Q4 a) Explain/define/clarify the following term **(10)**
(i) Modulation index in AM (ii) Modulation index in FM
(iii) Over modulation in AM (iv) Total power in AM
(v) Transmission bandwidth in AM & FM
b) State & explain classification of line codes with neat figure **(10)**

Q5 a) Draw the ASK, PSK & FSK waveforms for digital data 11010101
Also compare all three **techniques** of modulation **(6+4)** **(10)**
b) State and prove following properties of Fourier transforms
1) Time scaling 2) frequency shifting. **(10)**
Also state significance of these properties in communication system **(8+2)**

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Q6 Write short notes on following: **Any Four** **20 (5*4)**

a) Need of modulation
b) Ratio detector
c) Sky wave propagation
d) Quantization process
e) FM Noise triangle
f) Block diagram of analog communication system

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