(3 hours) **[Total Marks: 80]**

NB :

1. Question 1 is compulsory.
2. Out of remaining attempt any three
3. Assume suitable data wherever required.
4. Figures to the right indicate full marks.

Q 1 a Differentiate between File system with database management system [5]

b Describe roles of DBA [5]

c Explain aggregate functions of DBMS [5]

d Describe Generalization and specialization with example. [5]

Q 2 a Consider following database tables [10]

Emp (eid , ename , salary , Address , deptid)

Dept (Deptid , Dname , Address)

Construct the following SQL queries for this relational database.

i) Find name of employee whose address is “Bandra”

ii) Find name of employee earning highest salary

iii) Find all employee working for “HR” department

iv) Delete record of employee with minimum salary

v) Display Name of departments of the company

b Explain operations of file in details [10]

Q 3 a Describe design guide lines for relational schema with example [10]

b List various types of constraints in Database? Explain any two. [10]

Q 4 a Why joins are required? What are the types of Joins? Explain each with example. [10]

b Explain Stored Procedure & Function with example [10]

Q 5 a Draw and explain Database Management System Architecture [10]

b Explain conflict and view serializability with example [10]

Q 6 Write short note on following

a Role and Responsibilities of DBA. [5]

b Single Level Indexes [5]

c Hashing Technique [5]

d Set Operations [5]

QP CODE : 40342

(3 Hours) **Marks : 80**

N.B 1) Question **no. 1 is compulsory.**

2) Attempt **any three from remaining** questions.

Q. 1 **a** What is the need for constructor in a class ? **[10]**

Develop a class circle with instance variable radius that is initialized using constructor. Create 2 methods in the class to calculate area and perimeter of circle.

b Explain static data members and methods in a class **[5]**

c Compare method overloading and overriding with an example each. **[5]**

Q. 2 **a** Explain different types of relationships among entities. **[10]**

Define the relationships among the objects of given sentences:

1) Customer has Account.
2) CurrentAccount, SavingsAccount is a kind of Account.
3) Customer makes payment

b What is a thread?Which are the two ways to create a thread? **[10]**

Write a program to show interleaving of actions from 2 thread: t1 and t2 synchronizing on a shared object.

t1 print message "ping" and t2 print message "pong".

Q. 3 **a** An online shopping application requires a customer to have an account. Each customer has unique id and is linked to exactly one account. Account owns shopping cart and orders. Customer has to register as a web user and can make only online purchases. Every user has a login name which is unique. User could have multiple states, new, active, temporary blocked or banned and is linked to shopping cart. Shopping cart belongs to account. Customer add products to shopping cart and then create order. Each order has order status. Both order and shopping cart have line items linked to a specific product. There is payment associated with every order. **[10]**

Draw class diagram for the given scenario. Show the class attributes and methods and class relationships.

b Explain different types of coupling and cohesion **[10]**

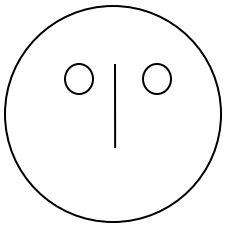
Q. 4 **a** How does do-while construction differ from that of while loop? **[10]**

Write a program that has 2 methods. The first method reads a list of numbers terminated by -999 into an ArrayList. The second method displays the second largest value in the list.

b What is checked and unchecked exception in Java? Explain the use of following in exception handling. **[5]**

Try-Catch, Finally, Throw, Throws

c Write an applet program to display **[5]**



Q. 5 **a** Explain creation of user defined package with an example. **[10]**

b Implement a class AnotherRectangle that extends Rectangle class and overrides the equals(...) method inherited from Object. Implement equals(...) so that 2 objects belonging to AnotherRectangle are equal if they agree in both length and width. **[10]**

Set length and width of rectangle using constructor.

Q. 6 **a** Differentiate between interface and abstract class. **[10]**

b Write short note on access specifiers. **[5]**

c Explain "write once and run anywhere" nature of Java. **[5]**

(3 hours) 80 Marks

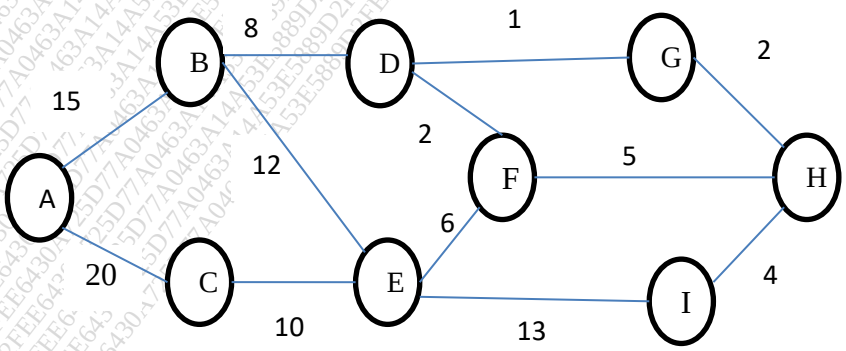
N.B 1) Question no. 1 is compulsory

2) Attempt any three questions out of remaining questions

3) Assume suitable data if necessary

4) Figure to Right indicates full marks.

Q.1	a) What is ADT? Write ADT for Stack.	3
	b) Explain Asymptotic notations	3
	c) Explain Complete Binary Tree with example	3
	d) Define Minimum spanning tree.	3
	e) Write an algorithm to count the number of nodes in singly linked list.	3
	f) Write properties of Red-Black tree.	3
	g) Define algorithm and state its properties	2
Q.2	a) Write an algorithm for insertion and deletion from doubly linked list.	10
	b) Write a program to implement QUEUE as an array.	10
Q.3	a) Construct Binary Tree from Inorder and postorder traversal given and write an algorithm to traverse a tree in inorder and postorder traversal. Inorder: I N F O R M A T I O N Postorder: I N O F M A I N O T R	10
	b) Write properties of Heap. Also build Max-Heap from given data: 56 , 12, 45, 33, 8, 63, 74, 25, 18, 36	10
Q.4	a) What is Binary Search Tree? Construct BST for following data set : 35, 13, 45, 8, 11, 39, 60, 55, 58, 5, 9, 18	10
	b) Find shortest path from A to H using Dijkjstra's algorithm	10



Q.5 a) Write an algorithm to implement STACK ADT using linked list. 10

b) Write an algorithm to implement merge sort. Explain it's time complexity. 10

Q.6 Write short note on (**any four**) 20

a) BFS algorithm

b) Selection sort

c) Circular Queue

d) Types of graphs

e) Linear and Non-linear data structures

****

Q.P. Code :23005

[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question no. 1 is compulsory.
2. Attempt any three of the remaining.
3. Figures to the right indicate full marks.

Q.1 a) Find the Laplace transform of e^{-4t} sinh t sin t. 05

b) Find half-range sine series for f(x) = $\frac{\pi}{4}$ in (0, π). 05

c) Find the values of Z for which the following function is not analytic. 05
Z= sin hu cos v + i cos hu sinv.

d) Show that $\nabla\left[\frac{(\bar{a}\ .\ \bar{r})}{r^n}\right] = \frac{\bar{a}}{r^n} - \frac{n(\bar{a}\ .\ \bar{r})\bar{r}}{r^{n+2}}$, where $\bar{a}$ is a constant vector. 05

Q.2 a) Find the inverse Z- transform of F(z) = $\frac{1}{(z-3)(z-2)}$ if $|z| < 2$. 06

b) Verify Laplace's equation for u = $\left(r + \frac{a^2}{r}\right)\cos\theta$ also find v and f(z). 06

c) Find the Fourier series for the periodic function 08
f(x) = $\begin{cases} -\pi & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$
State the value of f(x) at x=0 and hence, deduce that
$$\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$$

Q.3 a) Find $L^{-1}\left[\frac{1}{(S-3)(S-3)^2}\right]$ using convolution theorem. 06

b) Show that the set of functions sin x , sin 2x , sin 3x, ---------- is orthogonal on the interval [0,π] 06

c) Verify Green's Theorem for $\int_C \bar{F}\ .\ d\bar{r}$ where $\bar{F}$ = x^3i + xyj and c is the triangle whose vertices are (0,2) , (2,0) and (4,2) . 08

Q.4

a) Find Laplace transform of f(t) = $\begin{cases} a\ sinp\ t\ , & 0 < t < \frac{\pi}{p} \\ 0\ , & \frac{\pi}{p} < t < \frac{2\pi}{p} \end{cases}$ 06

and f(t) = f$\left(t + \frac{2\pi}{p}\right)$.

b) Show that $\bar{F}$ = (y^2-z^2+3yz-2x)i + (3xz+2xy)j + (3xy-2xz+2z)k is both solenoidal and irrotational. 06

c) Find half range cosine series for f(x) =x , 0<x<2. 08

Hence deduce that $\frac{\pi^4}{90} = \frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + - - - - -$

Q.5

a) Show that $\iint_S (\nabla r^n).\, d\bar{s}$ = n(n+1) $\iiint_V r^{n-2}$ dv using Gauss's Divergence theorem. 06

b) Find the Z-transform of $\{k^2\, e^{-ak}\}$, k ≥ 0 . 06

c) (i) Find $L^{-1}\left[\frac{s^2+2s+3}{(s^2+2s+2)(s^2+2s+5)}\right]$ 08

(ii) Find $L^{-1}\left[\frac{s^2+a^2}{\sqrt{s+b}}\right]$

Q.6

a) Use Laplace transform to solve, 06

$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = 1$ where, y(0) =0 , y'(0) = 1

b) Find the bilinear transformation which maps the points $z=\infty, i, 0$ onto the points 0,i,∞ respectively of w-plane. 06

c) Express the function f(x) = $\begin{cases} \frac{\pi}{2}\ , for\ 0 < x < \pi \\ 0\ , \quad for\ x > \pi \end{cases}$ 08

for Fourier Sine Integral and Show that

$\int_0^\infty \frac{1-cos\pi w}{w} \sin wx\ \ dw = \frac{\pi}{2}$ when 0<x<π

**********All THE BEST**********

(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

a) i) Convert $(13.078125)_{10}$ to binary.
ii) Convert $(B73D)_H$ into octal.
iii) Convert $(436)_8$ into hexadecimal.
iv) Convert $(845)_{10}$ into gray code. (4)

b) Sketch typical illumination characteristics for a photodiode and explain the theory of device. (4)

c) Derive the equation of stability factor for voltage divider bias circuit. (4)

d) Implement a full adder using 8:1 Demultiplexer. (4)

e) Write truth table and excitation table of JK flip flop. (4)

2. a) Explain inverting summing amplifier using op-amp. Derive the expression for output voltage. (8)

b) What are different methods used to improve CMRR in differential amplifier. (8)

c) Draw circuit diagram & waveforms of monostable multivibtrator using IC555. (4)

3. a) Design 2 bit magnitude comparator. (10)
b) Using K-map realize the following expression
$Y = \sum m\,(1, 3, 4, 5, 7, 9, 11, 13, 15)$ (5)

(c) Convert JK FF to D FF**.** (5)

4.a) With the help of neat circuit diagram explain the operation of Zener diode regulator for variable input voltage and variable load. (8)
b) Explain dataflow modeling style with suitable example. (6)
c) Compare schottky diode with PN junction diode (3 points) (6)

5. (a) Design a MOD-12 Asynchronous down counter**.** (8)
(b) What do you mean by operational amplifier? Explain the block diagram of opamp. (8)
(c) Write VHDL for full adder. (4)

6.(a) Write a short note on ASCII code and Excess-3 code. (8)
(b) What do you mean by universal gate? Implement NOT,AND,OR gates using NAND gates only. (8)
(c) Explain the difference between the integrator & differentiator .Give one application of each**.** (4)

****