Paper / Subject Code: 38904 / DATABASE MANAGEMENT SYSTEMS

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

N.B.: (1) Question no. 1 is compulsory.

(2) Attempt any three questions from remaining.

(3) Assume suitable data wherever necessary.

Q1	Attempt the following.	
(a)	What is difference between weak and strong entity sets?	(05)
(b)	List four significant differences between file processing system and DBMS.	(05)
(c)	Explain referential integrity constraints in SQL.	(05)
(d)	Explain ACID properties of transaction.	(05)

Q2(a)   Draw ER diagram for bank management system. Transform it into relational   (10) model.

Q2(b)   What are the types of failure in database system? Explain shadow copy and shadow paging schemes of recovery.   (10)

Q3(a)   Explain following SQL clauses with syntax and example of each clause: (10) IN, LIKE, ORDER BY and COUNT.

Q3(b)   What is normalization? Explain 1NF, 2NF & 3NF with suitable example.   (10)

Q4(a)   Explain two phased locking protocols in concurrency control.   (10)

Q4(b)   Explain various joins in SQL with example.   (10)

Q5(a)   What is a deadlock? Explain different types of deadlock prevention   (10) schemes.

Q5(b)   Explain four relational algebra operations with example.   (10)

Q6   Attempt the following **(any two)**   (20)

(a) Database system architecture

(b) Views and triggers in SQL

(c) Generalization-specialization and aggregation

(d) Cost based query optimization

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(3 Hours)   [Total Marks : 80]

N.B.   (1)Question No. 1 is compulsory
        (2) Attempt any three out of remaining five questions
        (3) Assumptions made should be clearly stated

1. (a) Explain Chomsky Hierarchy.   5
    (b) Differentiate between NFA and DFA.   5
    (c) Define Regular Expression and give regular expression for   5
            Set of all strings over { a, b,c } that starts and ends with different symbol.
    (d) Explain Post Correspondence problem.   5
2. (a) Design F.A. for following R.E.   10
            $(a+b)*abb(a+b)*$

    (b)Give and Explain formal definition of Pumping Lemma for Regular Language and   10
        prove that following language is not regular.
            $L=\{ a^n b^m |1<=n<=m \}$
3. (a) Test whether 001100, 001010 are in the language generated by grammar   10
            $S \rightarrow 0S0|0A|0|1B|1$
            $A \rightarrow 0A|0$
            $B \rightarrow 1B|1$

    and draw parse tree.

    (b) Construct PDA for a language $L=\{wcw^R | w\ \varepsilon\ \{a,b\}$ and w^R is reverse of w\}   10

4.   (a) Construct TM to check palindrome over $\Sigma=\{0,1\}$ 10

     (b) Explain CNF and GNF in detail and convert given grammar in GNF.   10

     $S \rightarrow XA|BB$

     $B \rightarrow b|SB$

     $X \rightarrow b$

     $A \rightarrow a$

5. (a) Convert $(0+1)(01)^*(0+\epsilon)$ into NFA with ε-moves and obtain DFA.   10

    (b) Design Mealy Machine that accepts an input from $(0+1)*$ if the input ends in 101,   10

        output A; if the input ends in 110, output B, otherwise C. then convert into

        Moore Machine.

6. Write short note on following (any 4)   20

    (a) Closure properties of Context Free Language

    (b) Myhill Nerode theorem

    (c) Rice's Theorem

    (d) Moore and Mealy Machine

    (e) Variant of TM

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Time Duration: 3Hr   **Total Marks: 80**

N.B.:1) Question no.1 is compulsory.
2) Attempt any three questions from Q.2 to Q.6.
3) Use of statistical tables permitted.
4) Figures to the right indicate full marks.

Q1. a) Evaluate $\int_C (z - z^2)dz$, where C is the upper half of circle $|z| = 1$. [5]

b) If A=$\begin{bmatrix} 2 & 1 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 3 \end{bmatrix}$, find the Eigen values of $A^2 - 2A + I$. [5]

c) State whether the following statement is true or false with reasoning: "The line of regression between x and y are parallel to the line of regression between 2x and 2y." [5]

d) Find the dual of the following L.P.P. [5]
Maximize $z = 3x_1 + 17x_2 + 9x_3$
Subject to $x_1 - x_2 + x_3 \geq 3$
$-3x_1 + 2x_3 \leq 1$
$2x_1 + x_2 - 5x_3 = 1$
$x_1, x_2, x_3 \geq 0$

Q2. a) Evaluate $\int_C \frac{1}{z^3(z+4)} dz$, where c is the circle $|z|=2$. [6]

b) Show that the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$ is non-derogatory. [6]

c) For a normal variate X with mean 2.5 and standard deviation 3.5 , find the probability that (i) $2 \leq X \leq 4.5$, (ii) $-1.5 \leq X \leq 5.3$. [8]

Q3. a) Find the expectation of number of failures preceding the first success in an infinite series of independent trials with constant probabilities p and q of success and failure respectively. [6]

b) Solve the following L.P.P. by simplex method [6]
Maximize $z = 3x_1 + 2x_2$
Subject to $x_1 + x_2 \leq 4$
$x_1 - x_2 \leq 2$
$x_1, x_2 \geq 0$

c) Expand $f(z) = \frac{2-z^2}{z(1-z)(2-z)}$ about $Z = 0$ indicating the region of convergence in each case. [8]

Q4. a) A biased coin is tossed n times. Prove that the probability of getting even number of heads is $0.5[1 + (q - p)^n]$. [6]

b) Calculate the coefficient of correlation between X and Y from the following data. [6]

X	100	200	300	400	500
Y	30	40	50	60	60

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c) Show that the matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalizable. Find the **[8]**
transforming matrix M and the diagonal form D.

Q5.a) Can it be concluded that the average life-span of an Indian is more than 70 years, **[6]**
if a random sample of 100 Indians has an average life span of 71.8 years with
standard deviation of 8.9 years?

b) Evaluate $\int_0^\infty \frac{1}{x^4+1} \, dx$, using Cauchy's residue theorem. **[6]**

c) Using the Kuhn – Tucker conditions, solve the following N.L.P.P. **[8]**
Minimize $\quad z = 7x_1^2 + 5x_2^2 - 6x_1$
Subject to $\quad x_1 + 2x_2 \leq 10$
$\qquad\qquad x_1 + 3x_2 \leq 9$
$\qquad\qquad x_1, x_2 \geq 0$

Q6.a) A die was thrown 132 times and the following frequencies were observed. **[6]**

No. obtained	1	2	3	4	5	6	Total
Frequency	15	20	25	15	29	28	132

Test the hypothesis that the die is unbiased.

b) If two independent random samples of sizes 15 and 8 have respectively the **[6]**
following means and population standard deviations,
$\overline{X_1} = 980 \quad \overline{X_2} = 1012$
$\sigma_1 = 75 \qquad \sigma_2 = 80$
Test the hypothesis that $\mu_1 = \mu_2$ at 5% level of significance.

b) Using Penalty (Big-M) method solve the following L.P.P. **[8]**
Maximise $\quad z = 3x_1 - x_2$
Subject to $\quad 2x_1 + x_2 \leq 2$
$\qquad\qquad x_1 + 3x_2 \geq 3$
$\qquad\qquad x_2 \leq 4$
$\qquad\qquad x_1, x_2 \geq 0$

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[Time: 3 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question number one is compulsory

2. Attempt any three from remaining five questions.

3. Assume any suitable data if necessary and justify the same.

Q.1	a)	What is aliasing and anti-aliasing? Explain anyone anti-aliasing method in detail	**05**
	b)	Explain the various polygon rendering models used in computer graphics.	**05**
	c)	Explain inside outside test used in polygon filling algorithm	**05**
	d)	Prove that two successive rotations are additive	**05**
Q.2	a)	Derive 2-D rotation matrix about an arbitrary point.	**10**
	b)	Rasterize a line segment using Bresenham's line drawing algorithm where starting coordinates of line segment are Pl(5,5) and ending coordinates are P2(l 3,9)	**10**
Q.3	a)	Explain Cohen Sutherland clipping algorithm. Apply the algorithm to the line with coordinates Pl(xl,yl) = (2, 2) and P2(x2,y2)=(l2, 9) against the window (xwmin,ywmin) = (4, 4) and (xwmax, ywmax) = (9, 8).	**10**
	b)	What is mean by parallel and perspective projections? Derive the matrix for parallel projection.	**10**
Q.4	a)	Explain Sutherland Hodgeman polygon clipping algorithm in detail	**10**
	b)	Explain half toning and dithering techniques in detail	**10**
Q.5	a)	Write and explain the properties of Bezier curve. Differentiate between Bezier and B spline curve.	**10**
	b)	What is object in object space, image in image space and derive the matrix for window to viewport transformation	**10**
Q.6	a)	What is Fractal? What is Fractal dimension? Explain Koch curve.	**10**
	b)	Derive 3-D rotation matrix about an arbitrary axis.	**10**

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(3 hrs)

[Total Marks: 80

CLASS: SE Computer Sem-IV CBSGS
SUBJECT: Computer Organization & Architecture

NB: 1) Q.1 is compulsory
2) Attempt any THREE questions from the remaining questions
3) Assume suitable data if necessary.

Q.1 a) Compare RISC and CISC processor.   [5]
    b) Explain functions of the following CPU registers.   [5]
        PC, MAR, MBR, IOAR and IR
    c) What is virtual memory?   [5]
    d) Explain various pipeline hazards.   [5]

Q.2 a) Explain Booth's algorithm with flowchart and find product of +5 & -15.   [10]
    b) Explain six stage instructions pipelining with suitable diagram.   [10]

Q.3 a) Discuss the functions of 8089 IO processor.   [10]

    b) Explain Flynn's classification with suitable diagrams.   [10]

Q.4 a) Using restoring division algorithm, divide 14 by 3.   [10]
    b) Explain the interleaved memory.   [10]

Q.5 a)Explain set associative and associative cache mapping techniques.   [10]
    b)Compare interrupt driven I/O and DMA.   [10]

Q.6 Write short notes on the following(Any 2)   [20]
    a. Addressing modes.
    b. Instruction cycle state diagram with interrupt.
   c. IEEE 754 standard for floating point numbers.

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(3 Hours)   (Total marks : 80)

Note: **(1) Question No. 1 is compulsory.**
      (2) Attempt any three questions out of remaining five questions.

Q1.   (a) Sort the following elements using merge sort: [08]
            70, 50, 30, 10, 20, 40, 60
     (b) Explain randomized algorithm with example   [06]
     (c) Explain binary search algorithm and derive its complexity.   [06]

Q2.   (a) Explain different string matching algorithms.   [10]
     (b) Explain 8-queen's problem with example.   [10]

Q3.   (a) Solve the following fractional knapsack problem: [10]
            Weights = { 40, 1 0, 20, 24}
            Profits = { 280, 100, 120, 120}   &   W = 60
     (b) Write an algorithm for sum of subsets. Hence solve the following problem: [10]
            S = {10, 7, 5, 18, 12, 20, 15}   &   M = 35

Q4.   (a) Write an algorithm to find minimum and maximum value using divide and
        conquer and also derive its complexity.   [10]
     (b) Explain the different asymptotic notations.   [10]

Q5.   (a) What is LCS? Find LCS for the following strings: [10]
            X = BACDB
            Y = BDCB
     (b) Find the minimum spanning tree for the following graph: [10]
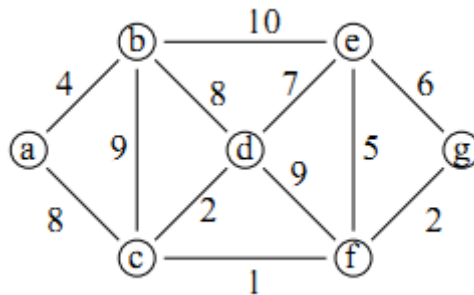
Q6.   Write note on **(any two)** :   [20]
     (a) 15-puzzle problem
     (b) Graph coloring
     (c) Strassen's matrix multiplication

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