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

N.B: (1) Question No.1 is compulsory
(2) Attempt any three questions of the remaining five questions
(3 Figures to the right indicate full marks
(4) Make suitable assumptions wherever necessary with proper justifications

Q.1 (a) Explain asymptotic notations. (5)
(b) Explain Randomized algorithms. (5)
(c) Write an Algorithm for Merge sort and derive its best case and worst case complexity. (10)

Q.2 (a) Explain Master's Theorem to find the complexity of a recurrence relation (10)
(b) Explain Naïve string matching algorithm with example. (10)

Q.3 (a) Explain Single source shortest path algorithm using Dynamic programming with suitable example. (10)
(b) Write an Algorithm for Graph Coloring problem. Also derive its complexity. (10)

Q.4 (a) Write an Algorithm for knapsack problem using Greedy method. Also derive its complexity (10)
(b) Explain the using Travelling Salesman Problem using Branch and Bound (10)

Q.5. (a) Explain Flow shop scheduling technique. (10)
(b) Write an Algorithm to find minimum cost spanning tree. Also derive its complexity. (10)

Q.6. Write Short notes on **(any two)** (20)
(a) Strassen's matrix multiplication
(b) Job- Sequencing with deadlines.
(c) Multistage Graphs

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

Q1. Answer the following 20M

a) State the properties of B-Spline Curves.

b) Differentiate between Raster scan display and Radom scan display.

c) Write matrix to perform 3D reflection about xy,yz and xz planes

d) Explain Homogenous co-ordinate system.

Q2 a) Explain drawback of the Sutherland Hodgman polygon clipping algorithm with example. 10M

b) (i) Derive the steps required to perform 2-Dimension fixed point scaling with the example. 10M

(ii) Derive the matrix in 2D for reflection of an object about a line y= mx+c

Q3 a) Explain Flood fill algorithm using 8 connected method. What is its advantage over boundary fill algorithm? 4M

b) Explain Cohen Sutherland line clipping algorithm.Apply the algorithm to clip the line segment A(120,70) and B(190,80) against the window Co-ordiante Xwmin = 80 , Xwmax = 180, Ywmin = 50 and Ywmax= 120. 8M

Q4 a) Construct the Bezier curve of order 3 and with 4 polygon vertices A(1,1),B(2,3),C(4,3) and D(6,4). 10M

b) Explain scan line hidden surface algorithm in detail. 10M

Q5 a) Derive the 3-D transformation for the rotation about an arbitrary axis. 10M

b) Explain Parallel and Perspective projection? Derive the matrix for perspective projection. 10M

Q6 a) Write and explain the depth buffer algorithm for detecting visible surface. 10M

b) Write short note on any two: 10M

(i) Scan line polygon filling algorithm.

(ii) Phong Shading algorithm.

(iii) Viewing Transformation

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Q. P. Code: 37067

(3 hours) Total Marks:80

N.B:

1. Question No .**1** is compulsory.
2. Answer any **three** questions from **Q. 2 to Q. 6**
3. Use of statistical tables permitted.
4. Figures to the right indicate full marks.

1) (a) A continous random variable x has the pdf $f(x) = kx^2e^{-x}$ where $x \geq 0$. Find k ,its mean and variance. 5

(b)State true or false with reasoning: 2x+y=3 and x=2y+3 cannot be the lines of regression. 5

(c)Find the relative maximum or minimum of the function $z=x_1^2+x_2^2+x_3^2-6x_1-8x_2-10x_3$. 5

(d)Find the eigen values of adj.A and A^2-2A+I where $A=\begin{bmatrix}2 & 3 & 4\\ 0 & 4 & 2\\ 0 & 0 & 3\end{bmatrix}$. 5

2) (a) Obtain the rank correlation coefficient from the following data. 6

X:	10	12	18	18	15	40
Y:	12	18	25	25	50	25

(b) The marks obtained by the students in Maths ,Physics & Chemistry in an examination are normally distributed with the means 52,50 & 48 and with standard deviations 10 ,8 & 6 respectively. Find the probability that a student selected at random has secured a total of i) 180 or above ii) 135 or less. 6

(c) Is the matrix $A=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix}$ diagonalisable? If so, find the diagonal form and the transformation matrix. 8

3) (a) If $A=\begin{bmatrix}1 & 0 & 0\\ 1 & 0 & 1\\ 0 & 1 & 0\end{bmatrix}$,find A^{50}. 6

(b) A die was thrown 132 times and the following frequencies were observed 6

No: obtained :	1	2	3	4	5	6
Frequencies :	15	20	25	15	29	28

Test the hypothesis that the die is unbiased.

(c) Use duality to solve the following linear programming problem. 8

Mnimise $Z = 4x_1+3x_2+6x_3$ subject to

$x_1+x_3 \geq 2;$

$x_2+x_3 \geq 5,$ $x_1, x_2, x_3 \geq 0.$

4) (a)A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160 cm. Can it be reasonably regarded that, in the population, the mean height is 165cm and the SD is 10cm? 6

(b) A transmission channel has a per digit error probability p=0.01.Calculate the probability of more than one error in 10 received digits using i) Binomial distribution ii) Poisson distribution. 6

(c) Evaluate $\int_0^{2\pi} \frac{1}{3+2cos\theta} d\theta$. 8

5 .(a) Evaluate $\int \frac{1}{z^3(z+4)} dz$ where C is the circle IzI=2 . 6

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

(c) Samples of 2 types of electric bulbs were tested for length of life and the following data were obtained 8

	Size	Mean	SD
Sample 1	8	1234h	36h
Sample 2	7	1036h	40h

Is the difference in the means sufficient to warrant that type 1 bulbs are superior to type 2 bulbs?

6 (a). Using the Big-M penalty method ,solve the following L.P.P 6

Minimise $Z=10x_1+3x_2$

subject to $x_1+ 2x_2 \geq 3$

$x_1+ 4x_2 \geq 4$ $x_1, x_2 \geq 0$.

(b)Use the Kuhn-Tucker conditions to solve the following N.L.P.P 6

Maximise $Z=2x_1^2 - 7x_2^2 + 12x_1x_2$

Subject to $2x_1 +5x_2 \leq 98$ $x_1, x_2 \geq 0$

(c)Obtain Taylor's and Laurent's expansion for f(z)=$\frac{z-1}{(z-3)(z+1)}$ indicating the regions of convergence. 8

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Q. P. Code:-22552

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

N.B.: (1) Question No.**1** is **compulsory**.
(2) Solve any **three** questions out of the remaining questions.
(3) Make **suitable** assumptions if **needed**.

1. (a). Explain ACID properties. **5**
(b) Discuss Generalization and Specialization in EER model. **5**
(c) Explain Aggregate Functions in SQL. **5**
(d) Describe Triggers with example. **5**

2. (a) Define Normalization. Discuss different Normalization Techniques with example. **10**
(b) Consider the following database schema: **10**
Employee(employee_name, street, city, date_of_join)
Works(employee_name ,company_name, salary)
Company(company_name, city)
Manages(employee_name, manager_name)
Solve the following queries using SQL:
i. Give all employee of ABC Company a 25% rise.
ii. Find all employees who live in the same cities and on the same street as their manager.
iii. Find all employees who join in the month of April.
iv. Delete the employee Jennifer belonging to XYZ Company.

3. (a) Explain types of integrity constraints with example. **10**
(b) Describe the overall architecture of DBMS with suitable diagram. **10**

4. (a) Draw an ER Diagram and convert it into relational model for a Hospital with a set of patients and set of doctors. Associate with each patient a log of various tests and examinations conducted. **10**
(b) Explain Security and Authorization in DBMS. **10**

5. (a) Explain the following Relational Algebra Operations with example: **10**
i. Cartesian Product iii. Generalized Projection
ii. Natural Join iv. Union
(b) Discuss conflict serializability and view serializability with examples. **10**

6. Write Short notes on: **20**
(a) Steps in Query Processing
(b) Role of Database Administrator
(c) Deadlocks
(d) Data Independence

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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) Write short note on Myhill Nerode theorem 5
   (b) Differentiate between NFA and DFA. 5
   (c) State and explain Closure properties of Context Free Language 5
   (d) Explain Post Correspondence problem. 5
2. (a) Construct the NFA-**ϵ**
   i for the language in which strings starts and ends different letter over the set ∑ = { a, b }
   ii) for the R.E (01+2*) 10

   (b) Give and Explain formal definition of Pumping Lemma for Regular Language and prove that following language is not regular. 10
   $L=\{ a^n b^m \mid 1<=n<=m \}$
3. (a) Convert the given grammar into Griebach Normal Form 10
   S -> aSB| aA
   A -> Aa | Sa | a
   (b) Construct PDA for a language $L=\{wcw^R \mid w \varepsilon \{a,b\}$ and w^R is reverse of w} 10
4. (a) Construct TM to check palindrome over **Σ**={0,1} 10
   (b) Design a DFA which accepts all strings not having more than 2 a's over ∑={a, b} 10
5. (a) Convert (0+1) $(01)^*$(0+∈) 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, output A; if the input ends in 110, output B, otherwise C. then convert into Moore Machine. 10
6. (a) Draw a parse tree for the string "abaaba" for the CFG given by G where 10
   P= { S-> aSa
   S -> bSb
   S -> a |b |**ε**}.
   Also Determine whether the given CFG is ambiguous or not.
   (b) Write short note on following 10
   i) Halting problem
   ii) Rice's Theorem

Q.P. Code :23693

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

Please check whether you have got the right question paper.

N.B:
1. Question.No.1 is compulsory.
2. Solve any three question out of remaining five question.
3. Assume suitable data if necessary
4. Figures to right indicate marks.

Q.1	Solve any four out of five		20
	a)	Write a note on scanner	
	b)	Draw and explain the flowchart of Add & shift method of integer multiplication	
	c)	Briefly explain Flynn's classification	
	d)	With the help of diagram, explain Von- Neumann's architecture	
	e)	What are the major functions of I/O module?	
Q.2	a)	Divide 6 by 2 using restoring division algorithms	10
	b)	Discuss various pipline hazards with example	10
Q.3	a)	Multiply (-2) and (2) using Booth's Algorithm.	10
	b)	Consider the string 9,4,2,3,2,9,5,9,4,2,6,7,5,3,4,2,3,2,4, Find the page faults for 3 frames using FIFO, Optimal & LRU page replacement policies .	10
Q.4	a)	Explain various cache mapping function	10
	b)	Draw and explain instruction cycle with interrupt execution	10
Q.5	a)	Explain the various characteristics of memory	10
	b)	Describe the register organization within the CPU	10
Q.6	a)	What is bus arbitration? Explain its techniques	10
	b)	What is the need of DMA? Explain its various techniques of data transfer	10