Duration: 3hrs   **[Max Marks: 80]**

N. B : **(1) Question No 1 is Compulsory.**
        (2) Attempt any three questions out of the remaining five.
        (3) All questions carry equal marks.
        (4) Assume suitable data, if required and state it clearly.

1		Attempt any FOUR	[20]
	a	Explain the Floating point Pipeline of Pentium Processor.	
	b	What is the advantage of Memory Banking in 8086 Processor? Justify with example.	
	c	Write an assembly language program for searching a Character in a Given String.(Consider your own String)	
	d	Explain the following instructions: XLAT, DAA, LAHF, AAA related to 8086.	
	e	Differentiate between real Mode, Virtual Mode and Protected Mode of 80386 Processor.	

2	a	Draw and explain write operation Timing diagram of 8086 Processor in Maximum mode.	[10]
	b	Draw and Explain the Master Slave Mode of 8259 Processor with Suitable example. Consider Slave 8259 connected to IR0 and IR4 of master.	[10]

3	a	Design 8086 microprocessor-based on following Specifications:
		  1. MP 8086 working at 10MHz minimum mode.
		  2. 64 KB ROM using 16KB Devices
		  3. 32KB RAM using 16KB chips
			[10]

	b	Explain Mode 2 of 8255 with a neat block diagram. Show the CWR initialization.	[10]

4	a	Explain the 8257 DMA controller with the help of neat diagram and explain its Control Register Format.	[10]
	b	Write an ALP for 8086 to arrange 10 numbers in ascending order.	[10]

5	a	Explain the segment descriptor of 80386 processor.	[10]
	b	Explain the EFLAG REGISTER of 80386 Processor.	[10]

6	a	Explain the interrupt structure of 8086 processor.	[10]
	b	Explain the Branch Prediction Mechanism of Pentium Processor.	[10]

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   (4) Assume suitable data, if required and state it clearly.

Q. 1		Attempt any **FOUR**	**[20]**
	a	Explain Goals and objectives of OS	**[5]**
	b	Differentiate between Preemptive and Non-preemptive scheduling algorithms	**[5]**
	c	Explain Resource Allocation Graph with an example	**[5]**
	d	Write in detail about Memory Management Requirements	**[5]**
	e	Discuss File access methods	**[5]**
Q. 2	**a**	Discuss Producer and Consumer problem with solution using Semaphore	**[10]**
	b	Explain different structures of Operating System	**[10]**
Q. 3	**a**	What is the role of PCB? Explain the structure of PCB with its disadvantages.	**[10]**
	b	Explain Deadlock Avoidance algorithms with example.	**[10]**
Q. 4	**a**	Explain Page Replacement Strategies with suitable examples	**[10]**
	b	Discuss in detail about Disk Scheduling Algorithms with an examples	**[10]**
Q. 5	**a**	Explain Memory Allocation Strategies with suitable examples	**[10]**
	b	Explain Five state Process model with two suspended states	**[10]**
Q. 6		Write short notes on Following	**[20]**
	a	Concept of Multithreading	**[5]**
	b	Principles of Concurrency	**[5]**
	c	TLB	**[5]**
	d	File Directories	**[5]**

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38918

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

N.B: (1) Question No. 1 is compulsory.
    (2) Attempt any three from the remaining questions.
    (3) Figures to the right indicate full marks.

1. Attempt any four   **(20)**
   (a) Explain recurrences and various methods to solve recurrences.
   (b) Explain in brief the concept of Multistage graphs?
   (c) Explain Asymptotic Notations.
   (d) Define P class, NP Class, NP-hard, NP-complete.
   (e) What is greedy algorithm?

2. (a) What is Knuth Morris Pratt Method of Pattern Matching? Give Examples.   **(10)**
   (b) Sort the following numbers using Merge Sort also, derive the time complexity of Merge Sort 7, 2, 9, 4, 3, 8, 6, 1.   **(10)**

3. (a) Explain and differentiate between greedy knapsack and 0/1 knapsack.   **(10)**
   (b) Explain Backtracking with n-queen problem.   **(10)**

4. (a) Find the LCS for following strings   **(10)**
                String 1- AGGTAB
                String 2- GXTXAYB
   (b) Explain quick sort with algorithm and example.   **(10)**

5. (a) Find MST of following graph using prims and Kruskal's Algorithm.   **(10)**
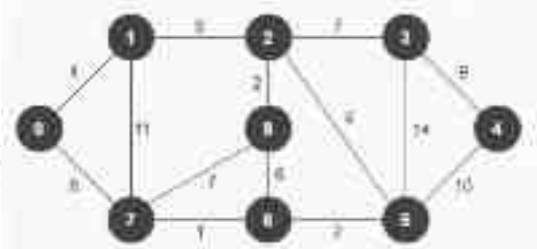
   (b) Write and explain sum of subset algorithm for n = 5, W = {2, 7, 8, 9, 15} M = 17.

             (10)

6. Write notes on any two: **(20)**
   (a) Write an algorithm to find the Minimum and Maximum values using divide and conquer strategy and also derive its complexity.
   (b) Explain Naïve string-matching algorithm with example.
   (c) Find the shortest path from source vertex S using Dijkstra's algorithm.

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39848
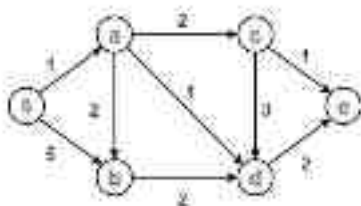
Time: 3 hrs   **Marks: 80**

Note :

1) **Q. No. 01 is compulsory.**
2) **Solve any three from Q. No. 02 to 06.**
3) **Numbers to the right indicate full marks.**
4) **Use of statistical tables is allowed.**

Q. 1.   Solve.

a) If $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ find the sum and product of Eigen values A.   5

b) Integrate the function $f(z) = z^2$ from A(0, 0) to B(1, 1) along straight line AB.   5

c) Find the Z-Transform of $(k) = a^k$, k < 0.   5

d) A transmission channel has a per-digit error probability p = 0.01. Calculate the probability of more than 1 error in 10 received digits using Poisson distribution.   5

Q. 2.

a) Find the Eigenvalues and Eigenvectors of the matrix $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$.   6

b) Find the Z-Transform of $Cos\left(\frac{k\pi}{4} + \alpha\right)$ k ≥ 0.   6

c) Use the dual simplex method to solve the LPP
Min.. Z = 2X₁ + 2X₂ + 4X₃
2X₁ + 3X₂ + 5X₃ ≥ 2 , 3X₁ + X₂ + 7X₃ ≤ 3, X₁ + 4X₂ + 6X₃ ≤ 5   X₁, X₂, X₃ ≥ 0   8

Q. 3.

a) Evaluate $\int_C \frac{z^2}{(z-1)(z-2)} dz$ Where C is a circle $|z - 1|=1$.   6

b) Verify Caley-Hamilton theorem and hence find A^{-1} and A^4 where $A =$
$\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$.   6

c) Solve the LPP by Big -M method
Maximize Z = 3X₁ - 2X₂
subject to 2X₁ +X₂ ≤ 2, X₁ +3 ≥ 3,   X₁, X₂, ≥ 0 .   8

40268   **Page 1 of 2**

Q. 4.

a) Find inverse Z transform of $F(z) = \frac{1}{(z-1)(z-3)}$ for i) $|z| < 1$, ii) $1 < |z| < 3$. 6

b) The following data represent the marks obtained by 12 students in two tests, one held before the coaching and the other after the coaching.

   Test I : 55, 60, 65, 75, 49, 25, 18, 30, 35, 51, 61, 72. 6
   Test II : 63, 70, 70, 81, 54, 29, 21, 38, 32, 50, 70, 80.

   Do the data indicate that the coaching was effective in improving the performance of the students?

c) Find all possible Laurent's series expansions of the function $f(z) = \frac{1}{(z-1)(z+2)}$ about

   $z = 0$ indicating the region of convergence in each case. 8

Q. 5.

a) Determine all basic solutions to the following problem

   Max. $Z = x_1 - 2x_2 + 4x_3$ 6

   $x_1 + 2x_2 + 3x_3 = 7$, $3x_1 + 4x_2 + 6x_3 = 15$, $x_1, x_2, x_3 \geq 0$.

b) Using Normal distribution, find the probability of getting 55 heads in the toss of 100 fair coins. 6

c) Solve the NLPP

   Optimize $Z = 10x_1 + 8x_2 + 6x_3 + 2x_1^2 + x_2^2 + 3x_3^2 - 100$

   Subject to $x_1 + x_2 + x_3 = 20$, $x_1, x_2, x_3 \geq 0$. 8

Q. 6.

a) Show that the given matrix is diagonalizable and hence find diagonal form and

   transforming matrix where $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$. 6

b) Of the 64 off springs of a certain cross between guinea pigs 34 were red, 10 were black and 20 were white. According to the generic model these numbers should be in the ratio 9 : 3 : 4. Use 2- test to check whether the data are consistent with the model. 6

c) Max. $Z = 4x_1 + 6x_2 - x_1^2 - x_2^2 - x_3^2$, Subject to $x_1 + x_2 \leq 2$ and $2x_1 + 3x_2 \leq 12$, $x_1, x_2 \geq 0$ by K-T condition. 8

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Duration: 3hrs   **[Max Marks:80]**

N.B. : (1) Question No 1 is Compulsory.

(2) Attempt any three questions out of the remaining five.

(3) All questions carry equal marks.

(4) Assume suitable data, if required and state it clearly.

1		Attempt any FOUR	[20]
	a	Explain the concept of data independence .Discuss the differences between logical and physical data independence	[5]
	b	Describe weak entity. Provide an example of weak entity and strong entity.	[5]
	c	List and briefly explain SQL aggregate functions with suitable examples	[5]
	d	Explain the concept of First Normal Form (1NF).Give example for the same.	[5]
	e	Discuss conflict serializability with suitable example.	[5]
2	a	Describe the overall architecture of DBMS with suitable diagram	[10]
	b	What is deadlock? Explain wait-die and wound-wait methods with suitable example.	[10]
3	a	Draw an E-R diagram for library management system. Convert it into relational schema	[10]
	b	Explain the following Relational Algebra operations with suitable example.	[10]

                    1) Project 2) Select

                     3) Union 4) Rename

                    5) Set difference

4 a Consider the following employee database.   [10]

Employee (<u>empname,</u> street, city, date_of_joining)

Works (empname, company_name,salary)

Company (<u>company_name</u>, city)

Write SQL queries for the following statements.

1. Modify the database so that 'John' now lives in 'Mumbai'.
2. Find all employees who joined in the month of October.
3. Give all employees of 'ABC Corporation' a 10% raise.
4. Find all employees who earn more than average salary of all employees of their company
5. List name of companies starting with letter "A"

b Why there is need of normalization? Explain 1NF, 2NF, 3NF and BCNF with   [10]
example.

5 a Describe ACID properties with examples   [10]

b Explain Lock based (2PL) concurrency control method with example   [10]

6 Write short note on the following(Any four)   [20]

a Conversion of Specialization to relational schema with suitable example   [05]

b   Log based recovery   [05]

c Role of DBA   [05]

d Triggers   [05]

e Types of attributes   [05]

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