

(OLD COURSE)**QP Code :14312**

(3 Hours)

[Total Marks : 100]

- N.B.:** (1) Question No. 1 is compulsory.
 (2) Attempt any four questions out of the remaining six questions.
 (3) **Figures** to the right indicate full marks.

1. (a) Prove that the eigen values of $\begin{bmatrix} \frac{(1+i)}{2} & \frac{-(1-i)}{2} \\ \frac{(1+i)}{2} & \frac{(1-i)}{2} \end{bmatrix}$ are of unit moduls. 5

(b) If $u = -r^3 \sin 3\theta$ find the analytic function $f(z)$ in terms of z where u is the real part of $f(z)$. 5

(c) Evaluate $\int_C \frac{2z+3}{z} dz$ where C is the lower half of the circle $|z| = 2$. 5

(d) Determine all basic feasible solutions of the equation

$$\begin{aligned} 2x_1 + 6x_2 + 2x_3 + x_4 &= 3 \\ 6x_1 + 4x_2 + 4x_3 + 6x_4 &= 2 \end{aligned}$$

5

2. (a) Find the characteristics equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and verify that it is satisfied 6

by A and hence obtain A^{-1} .

(b) Find the analytic function $w(z) = u + iv$ if $3u + 2v = y^2 - x^2 + 16xy$. 6

(c) Using Duality solve the L.P.P. 8

Minimise $z = 4x_1 + 3x_2 + 6x_3$

Subject to $x_1 + x_3 \geq 2$

$x_2 + x_3 \geq 5$

$x_1, x_2, x_3 \geq 0$

[TURN OVER]

3. (a) If $A = \begin{bmatrix} \alpha & \alpha \\ \alpha & \alpha \end{bmatrix}$ prove that $e^A = e^\alpha \begin{bmatrix} \cosh \alpha & \sinh \alpha \\ \sinh \alpha & \cosh \alpha \end{bmatrix}$ 6

(b) Solve the LPP by simplex method. 6

Minimise $z = 6x_1 - 2x_2 + 3x_3$

Subject to $2x_1 - x_2 + 2x_3 \leq 2$

$x_1 + 4x_3 \leq 4$

$x_1, x_2, x_3 \geq 0$

(c) Evaluate $\int_0^{2\pi} \frac{d\theta}{25 - 16\cos^2 \theta}$. 8

4. (a) If $w = f(z)$ prove that $\frac{dw}{dz} = (\cos\theta - i\sin\theta) \frac{\partial w}{\partial r}$. 6

(b) Obtain two distinct Laurent's series for $f(z) = \frac{2z-3}{z^2-4z-3}$ 6

(c) Find eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ 8

5. (a) Show that $A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$ is derogatory. 6

(b) Find the image of the circle $|z| = 2$ under the transformation $w = z+3+2i$ 6

(c) Solve the NLPP using the method of Lagrangian multipliers. 8

Optimise $z = 4x_1^2 + 2x_2^2 + 4x_3^2 - 4x_1x_2$

Subject to $x_1 + x_2 + x_3 = 15$

$2x_1 - x_2 + 2x_3 = 20$

$x_1, x_2, x_3 \geq 0$

[TURN OVER

6. (a) Find the orthogonal trajectory of the family of curves given by $2x - x^3 + 3xy^2 = a$ 6
 (b) Solve the NLPP using Kuhn-Tucker conditions 6

$$\text{Maximise } z = 2x_1^2 - 7x_2^2 + 12x_1x_2$$

$$\text{Subject to } 2x_1 + 5x_2 \leq 98$$

$$x_1, x_2 \geq 0$$

- (c) Evaluate $\int_C \frac{z+1}{z^3 - 2z^2} dz$ where C is 8

(a) the circle $|z| = 1$

(b) the circle $|z-2-i| = 2$

(c) the circle $|z-1-2i| = 2$

7. (a) Find the bilinear transformation which maps the points 2, i, -2 onto the points 1, i, -1. 6

- (b) Using residue theorem evaluate $\oint_C \frac{e^{2z}}{(z-\pi i)^3} dz$ where C is $|z-2i| = 2$ 6

- (c) Use the dual simplex method solve the LPP 8

$$\text{Minimise } z = 6x_1 + x_2$$

$$\text{Subject to } 2x_1 + x_2 \geq 3$$

$$x_1 - x_2 \geq 0$$

$$x_1, x_2 \geq 0$$

QP Code :14345**(OLD COURSE)****(3 Hours)****[Total Marks : 100**

- N.B. :** (1) Question No.1 is **compulsory**.
 (2) Solve any **four** questions from **remaining**.
 (3) Assume **appropriate** data where **necessary**.
 (4) **All** questions carry **equal** marks.

1. (a) Define the following terms with the help of example 10
 (i) Single valued and multi valued attribute
 (ii) Entity set and weak entity
 (iii) Simple and composite attribute
 (iv) Relationship
- (b) Describe the overall architecture of DBMS. 10
2. (a) Explain in detail log based recovery. 10
 (b) What is Transaction? Explain ACID properties of a transaction. 10
3. (a) Define Normalization? What is the importance of Normalization in database design? 10
 Explain 1NF, 3NF and BCNF with example.
- (b) Explain Timestamp ordering protocol. 10
4. (a) Explain the 2 phase locking protocol. 10
 (b) Explain the concept of Shadow paging. 10
5. (a) Explain the deferred and immediate database modification method with example. 10
 (b) Explain any five Relational algebra operations. 10
6. (a) What is Recoverable Schedule? Why recoverability of schedule is desirable? Are there any circumstances under which it would be desirable to allow non-recoverable schedule? 10
- (b) What are the functions of Database Administrator. 10
7. Write short notes on (any two):- 20
 (a) Shadow paging
 (b) Buffer management
 (c) Generalization and Aggregation

QP Code : 14394

(OLD COURSE)

(3 Hours)

Total Marks : 100

- N. B. :** (1) Question No.1 is compulsory
(2) Attempt any **four** questions from Q. No. 2 to 7
(3) Assume **suitable** data if **necessary**

1. (a) What do you mean by term Computer Graphics? State various applications of it. 5
(b) Explain different color models. 5
(c) Explain antialiasing technique. 5
(d) Draw matrices for representing following operations: 5
(i) Translation (ii) Scaling (iii) Rotation
2. (a) What is window? What is viewport? Assume window and viewport are rectangular. Derive the formulas required for transforming a point (X_w, Y_w) in a window to point (X_v, Y_v) in viewport. 10
(b) Compare boundary fill and flood fill algorithm. Illustrate one example with Diagram. 10
3. (a) Define fractals? Give classification of fractals. What is fractal dimension? 10
(b) Explain Sutherland-Hodgeman Polygon clipping algorithm. 10
4. (a) What do you mean by segment? What are the various attributes in segment table? State which operations can be done on segment and explain the same. 10
(b) Explain Liang Barsky line clipping algorithm. 10
5. (a) What is 3D clipping? Derive equations for all the planes (left, right, top, bottom, front, back) 10
(b) Illustrate inside outside test used in filling algorithms. 10
6. (a) Explain in brief Raster scan display system. 10
(b) Explain Mid-Point circle algorithm along this explain all mathematical derivation. 10
7. Write short notes on following (**Any four**) 20
(a) Shading Algorithms
(b) Color Models
(c) Dithering Technique
(d) Character generation method
(e) B-spline and Bezier Curve

(OLD COURSE)

QP Code : 14430

(3 Hours)

[Total Marks : 100

- N. B. :** (1) Question No. 1 is compulsory.
(2) Solve **any four** out of remaining **six question**.
(3) Figures to the **right indicate** full marks.

1. Attempt any **FOUR**.

- (a) What is frequency modulation? Write mathematical expression for the same. **5**
(b) Define amplitude modulation and draw modulating, carrier and AM wave form. **5**
(c) B.W of video signal is 4.5 MHz, signal to be transmitted using PCM with no. of quantification levels $Q=1024$. Sampling rate should be 20% higher than Nyquist rate. Calculate system bit rate. **5**
(d) List advantages of digital communication. **5**
(e) Write Shannon's channel capacity theorem and explain. **5**
2. (a) Derive mathematical expression for spectrum of AM wave and Plot it. **10**
(b) A 10 KW carrier wave is amplitude modulated at 80% depth of modulation by a sinusoidal modulating signal calculate the sideband power, total power and transmission efficiency of AM wave. **10**
3. (a) Explain BPSK modulation method. Show graphical representation of BPSK signal. **10**
(b) Draw block diagram of BPSK generator and explain. **10**
4. (a) Explain the principle operation of time division multiplexing system with appropriate diagram. **10**
(b) Three signals having data rate of 2 kbps are grouped together by means of TDM, each unit consists of 1 bit. **10**

Calculate :-

- (i) Bit duration before multiplexing
(ii) Transmission rate of TDM
(iii) Duration of each time slot in TDM
(iv) Duration of one TDM frame
5. In (6,3) Linear block code, if generator matrix G **20**

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

- (i) Construct all possible code words
(ii) Write down parity check matrix
(iii) Explain how to find out syndrome S for any given data.

6. (a) Information source emits one of four possible symbols once every 10 millisecond interval. Symbols occur with probabilities.

$$P_1 = 0.3$$

$$P_2 = 0.3$$

$$P_3 = 0.2$$

$$P_4 = 0.2$$

- (i) Find information content of each of these messages.
- (ii) Find Entropy H.
- (iii) Information rate R.

- (b) Explain with block diagram Delta modulation and Adaptive delta modulation. 10

7. Write notes on : (any four) 20

- (i) Quadrature Amplitude shift keying (QASK)
 - (ii) Convolutional coding
 - (iii) Line coding
 - (iv) FM generation
 - (v) PAM, PWM, PPM
 - (vi) Different types of noise.
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(OLD COURSE)

(3 Hours)

[Total Marks : 100

- N. B. :** (1) Question No.1 is compulsory.
(2) Solve **any four** form remaining
(3) **Figures** to right **indicate** marks.

1. (a) Explain insertion sort Algorithm show one example solved by insertion sort. **10**
(b) Explain a searching technique using divide and conquer strategy. What are other searching techniques? **10**
2. (a) What are different collision handling techniques in hashing? Explain in detail. **10**
(b) Write Kruskal's algorithm for minimum spanning tree. **10**
3. (a) Explain non recursive Quicksort Algorithm with example. **10**
(b) Give algorithm for BFS. Take a sample graph and show traversal by BFS Technique. **10**
4. (a) What is warshall's algorithm for shortest path? Explain with example. **10**
(b) What is backtracking strategy of problem solving? List examples which are solved by Backtracking. **10**
5. (a) Explain knapsack problem.How it is solved by greedy approach? **10**
(b) What is strasten's matrix multiplication? Explain Algorithm. **10**
6. (a) Write a note on Travelling salesperson problem. How this problem is solved? Devise Algorithm. **10**
(b) Write difference between following Algorithmic strategies. **10**
 - (i) Greedy Vs Dynamic
 - (ii) Greedy Vs Dvide and conquer
7. (a) Write short notes on **Any Two** :- **20**
 - (i) N-queens problem
 - (ii) NP-hard and NP- complete problems
 - (iii) Binary search Tree Insertion

(OLD COURSE)

(3 Hours)

QP Code : 14505

[Total Marks : 100]

- N.B. :** (1) Question No. 1 is compulsory.
 (2) Attempt any **four** questions out of **remaining**.
 (3) Assume **suitable data** if **necessary**.

1. (a) What is OS ? Explain functions of OS. 10
 (b) Differentiate between monolithic and Microkernel architecture of OS. 10
2. (a) Explain Paging with segmentation. 10
 (b) Explain RFID with different levels. 10
3. (a) Explain solution to Producer-Consumer problem using semaphores. 10
 (b) Explain different file organization techniques. 10
4. (a) Explain necessary and sufficient conditions for deadlock to occur. 10
 Explain different techniques for deadlock prevention.
 (b) Consider the following set of processes with length of CPU bursts given in millisecs 10
 as follows :—

Process	Bursts Time	Arrival Time	Priority
P1	8	0	3
P2	1	1	1
P3	3	2	2
P4	2	3	3
P5	6	4	4

- (i) Draw Gantt charts for FCFS, SJF, Preemptive priority and R-R(quantum = 2)
 (ii) What is waiting time and turnaround time of each process for above algorithms ?
 (iii) Which algorithm results in minimum average waiting time ?
5. (a) Explain different disk scheduling algorithms. 10
 (b) Calculate hit and miss using LRU, FIFO and OPT page replacement methods for 10
 following page sequences.
 4, 7, 3, 0, 1, 7, 3, 8, 5, 4, 5, 3, 4, 7
 Page frame size is 3.
6. (a) Explain process management in Linux. 10
 (b) Explain architecture of Windows OS. 10
7. Write short notes on (any **four**) :— 20
 (a) System Calls.
 (b) Inodes.
 (c) Race condition.
 (d) Distributed OS.
 (e) RTOS.