

(OLD COURSE)QP Code : **MV-18804**

(3 Hours)

[Total Marks :100

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

1. (a) Find k such that 5

$$\frac{1}{2} \log(x^2 + y^2) + i \tan^{-1} \frac{kx}{y} \text{ is analytic}$$

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

- (c) Consider the following problem : 5

$$\begin{aligned} \text{Maximise } & z = x_1 - 2x_2 + 4x_3 \\ \text{Subject to } & x_1 + 2x_2 + 3x_3 = 7 \\ & 3x_1 + 4x_2 + 6x_3 = 15 \\ \text{and } & x_1, x_2, x_3 \geq 0 \end{aligned}$$

- (d) Evaluate $\int_c \frac{\sin^6 z}{\left(z - \frac{\pi}{6}\right)^3} dz$ where c is $|z|=1$ 5

2. (a) Evaluate $\int_0^{1+i} z^2 dz$ along the line $x=y^2$ 6

- (b) Find the Eigen values and Eigen vectors of the matrix. 6

$$A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$$

- (c) Solve by penalty (Big-M) method 8

$$\begin{aligned} \text{Minimise } & z = 2x_1 + x_2 + 3x_3 \\ \text{Subject to } & 3x_1 + x_2 - 2x_3 \geq 1 \\ & x_1 - 2x_2 - x_3 \geq 2 \\ \text{and } & x_1, x_2, x_3 \geq 0 \end{aligned}$$

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3. (a) Solve the following LPP by simplex method 6

$$\begin{aligned} \text{Maximise } z &= x_1 - 3x_2 + 2x_3 \\ \text{Subject to } 3x_1 - x_2 + 2x_3 &\leq 7 \\ 2x_1 - 4x_2 &\geq -12 \\ -4x_1 + 3x_2 + 8x_3 &\leq 10 \\ \text{and } x_1, x_2, x_3 &\geq 0 \end{aligned}$$

- (b) Compute $A^9 - 6A^8 + 10A^7 - 3A^6 + A + I$ 6

$$\text{Where } A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 3 & 1 \\ 1 & 0 & 2 \end{bmatrix}$$

- (c) Obtain Taylor's and Laurent's expansions of $f(z) = \frac{2}{(z-1)(z-2)}$ indicating regions of convergenes. 8

4. (a) Use the dual simplex method to solve the following :- 6

$$\begin{aligned} \text{Minimise } z &= 2x_1 + 2x_2 + 4x_3 \\ \text{Subject to } 2x_1 + 3x_2 + 5x_3 &\geq 2 \\ 3x_1 + x_2 + 7x_3 &\leq 3 \\ x_1 + 4x_2 + 6x_3 &\leq 5 \\ \text{and } x_1, x_2, x_3 &\geq 0 \end{aligned}$$

- (b) If $v = 3x^2y + 6xy - y^3$, show that v is Harmonic and find the corresponding analytic function. 6

- (c) Show that 8

$$A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix} \text{ is derogatory.}$$

5. (a) If $A = \begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$ 6

$$\text{prove that } A^{50} = \begin{bmatrix} -149 & -150 \\ 150 & 151 \end{bmatrix}$$

- (b) Find the Bilinear transformation which maps the points $z = \infty, i, 0$ on to the points $w = 0, i, \infty$ 6

- (c) Solve by using Lagrange's multiplier method the following N.L.P.P. 8

$$\begin{aligned} \text{Optimise} \quad & Z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100 \\ \text{Subject to} \quad & x_1 + x_2 + x_3 = 20 \\ \text{and} \quad & x_1, x_2, x_3 \geq 0 \end{aligned}$$

6. (a) Construct the dual of the following LPP 6

$$\begin{aligned} \text{Maximise} \quad & z = 2x_1 - x_2 + 4x_3 \\ \text{Subject to} \quad & x_1 + 2x_2 - x_3 \leq 5 \\ & 2x_1 - x_2 + x_3 \leq 6 \\ & x_1 + x_2 + 3x_3 \leq 10 \\ & 4x_1 + x_3 \leq 12 \\ \text{and} \quad & x_1, x_2, x_3 \geq 0 \end{aligned}$$

- (b) Using the Residue Theorem, 6

$$\text{Evaluate } \int_c \frac{z^2}{(z-1)^2(z+1)} dz,$$

Where c is the circle $|z|=2$

- (c) Show that the matrix 8

$$A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$$

is diagonalisable. Find the transforming matrix and the diagonal matrix.

7. (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{5+3\sin\theta}$ 6

- (b) If $f(z) = u + iv$ is analytic and $u - v = e^x (\cos x - \sin y)$, find $f(z)$ in terms of z . 6

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

$$\begin{aligned} \text{Maximise} \quad & Z = 2x_1^2 - 7x_2^2 + 12x_1x_2 \\ \text{Subject to} \quad & 2x_1 + 5x_2 \leq 98 \\ \text{and} \quad & x_1, x_2 \geq 0 \end{aligned}$$

SE SEM IV C M P N (old) CG 29/5/2014

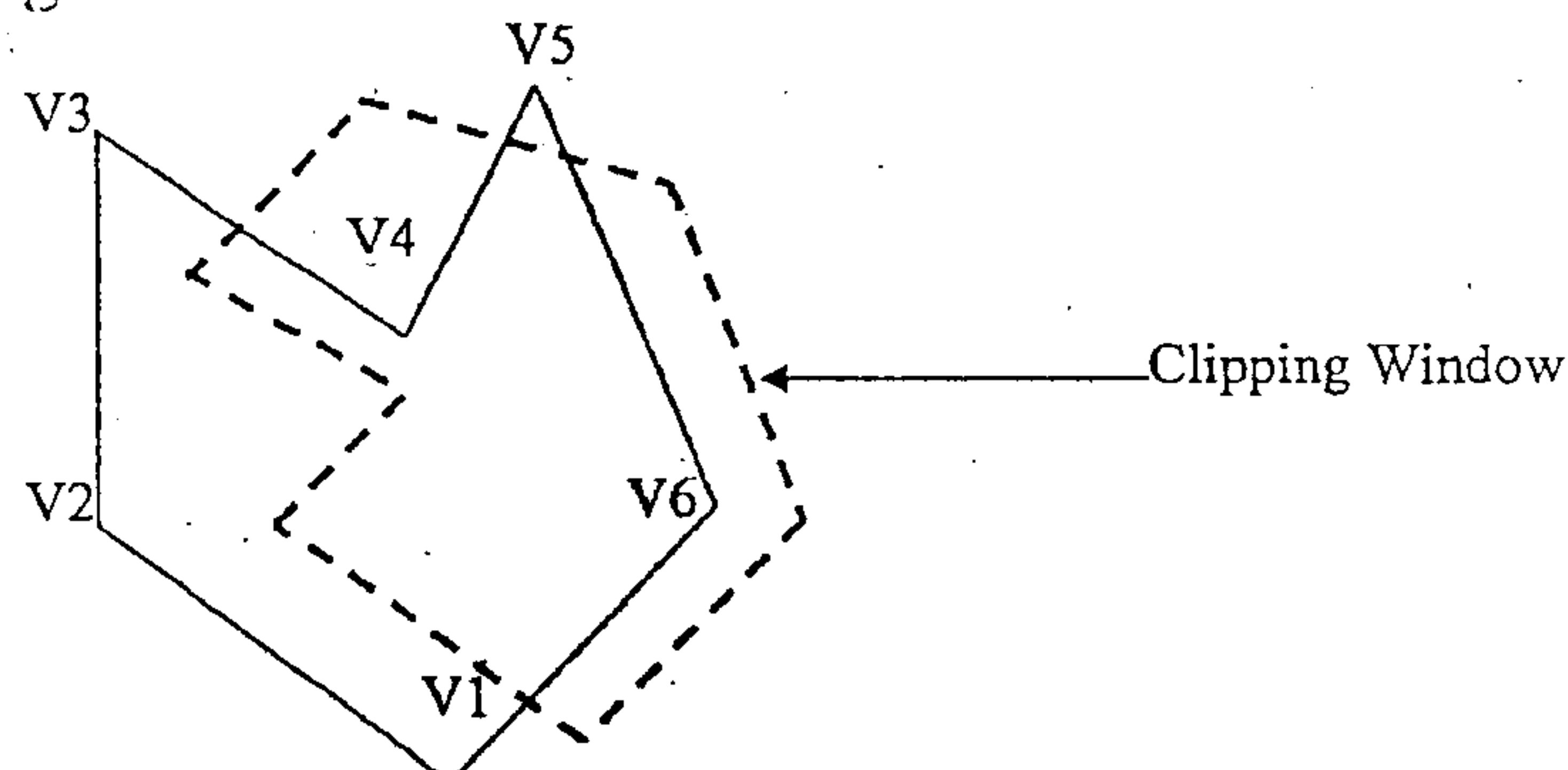
(OLD COURSE) QP Code : MV-18876

(3 Hours)

[Total Marks : 100

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

1. (a) Write Boundary fill procedure to fill an 8 connected region. 5
(b) Prove that two successive rotations are additive. $R(\theta_1).R(\theta_2) = R(\theta_1 + \theta_2)$. 5
(c) Write short note on Text Clipping Methods. 5
(d) Differentiate Parallel and Perspective projection. 5
2. (a) Discuss the segment table along with operations on segment. What are the other Displays file structures used ? 10
(b) Solve using Liang Barsky line clipping algorithm where $(x_{wmin}, x_{wmax}) = (1, 9)$ and $(y_{wmin}, y_{wmax}) = (2, 8)$ for line segments P1(3, 7) to P2(3, 10), P3(6, 6) to P4(8, 9) and P5(-1, 7) to P6(11, 1). 10
3. (a) Write short notes on :— 10
(i) Phong Shading (ii) Gouraud Shading
(b) Explain mid point circle algorithm. In order to support your explanation, show Mathematical derivation. 10
4. (a) Explain Warnock's algorithm used to remove Hidden surfaces with example. 10
(b) Explain Cohen Sutherland Line clipping algorithm. 10
5. (a) Derive 2D transformation matrix, for performing rotation of given point P(x, y). By angle θ (theta) in anticlockwise direction about origin. Also explain the steps Required if rotation has to be carried out about Fixed Point(Xf, Yf). 10
(b) State mathematical equation for Bezier curve and Bezier surfaces. Explain Properties of Bezier curve. 10
6. (a) Explain Sutherland Hodgeman polygon clipping algorithm with example. 10
(b) Explain Bit map character generation method. 5
(c) What do you understand by Diffuse Illumination and Point source Illumination ? 5
7. (a) Explain how Weiler Atherton algorithm works for convex polygons ? Clip the polygon using the above. 10



- (b) What is 3D clipping ? Derive equations for all the planes. 10

SE - comp - old) 23/5/14
DBMS - Sem - IV

(OLD COURSE) QP Code : **MV-18837**

(3 Hours)

[Total Marks : 100

- N. B. :** (1) Questions No. '1 is compulsory.
(2) Out of remaining six questions attempt **any four** questions.
(3) In all **five** questions to be attempted.
(4) All questions carry **equal marks**.
(5) Answer to each new question to be started on fresh page.

1. (a) Consider a MOVIE database in which data is recorded about the movie industry. The data requirements are summarized as follows: 10
- Each movie is identified by title and year of release. Each movie has a length in minutes. Each has a production company, and each is classified under one or more genres (such as horror, action, drama, and so forth). Each movie has one or more directors and one or more actors appear in it. Each movie also has a plot outline. Finally, each movie has zero or more quotable quotes, each of which is spoken by a particular actor appearing in the movie.
 - Actors are identified by name and date of birth and appear in one of more movies. Each actor has a role in the movie.
 - Directors are also identified by name and date of birth and direct one or more movies. It is possible for a director to act in a movie (including one that he or she may also direct).
 - Production companies are identified by name and each has an address. A production company produces one or more movies.
- (i) Draw ER diagram according to the above requirements.
(ii) Convert the ER diagram into equivalent schema.
- (b) Explain the following terms with example. 10
- (i) Weak Entity Set
 - (ii) Project operator in relational algebra
 - (iii) Foreign Key
 - (iv) Right outer join
 - (v) DML
2. (a) **employee** (employee-name, street, city) 10
works (employee-name, company-name, salary)
company (company-name, city)
manages (employee-name, manager-name)
- (i) Create relations employee and works.

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- (ii) Add a new employee to the database; assume any values for required attributes.
- (iii) Delete the works details for the employee "Sachin Parkar".
- (iv) Find all employees in the database who do not work for State Bank of India.
- (v) Find the company that has the most employees.
- (b) Explain the database system architecture. 10
3. (a) **employee** (person-name, street, city) 10
works (person-name, company-name, salary)
company (company-name, city)
manages (person-name, manager-name)
- Solve the following Queries using relational algebra:
- (i) Modify the database so that "Sachin" now lives in "Agra"
- (ii) Find the names, street address, and cities of residence of all employees who work for ICICI and earn more than Rs. 10,000 per month.
- (iii) Find the company with the smallest payroll.
- (iv) Find the names of all employees in this database who do not work for ICICI Bank.
- (v) Find the company name which is in Mumbai.
- (b) Explain Conflict Serializability with example. 10
4. (a) (i) Compute the closure of the following set F of functional dependencies 5
for relation schema $R = (A, B, C, D, E)$.
 $A \rightarrow BC$
 $CD \rightarrow E$
 $B \rightarrow D$
 $E \rightarrow A$
- List the candidate keys for R.
- (ii) Explain Third Normal Form and BCNF with example. 5
- (b) Explain B+ tree with examples of various operation (insertion, deletion). 10
5. (a) Explain timestamp ordering protocol 10

(b) Consider the following two transactions: 10

```
T31:read(A);  
read(B);  
if A = 0 then B: = B + 1;  
write (B);
```

```
T32:read(B);  
read(A);  
if B = 0 then A: = A + 1;  
write (A);
```

Add lock and unlock instructions to transactions T31 and T32, so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock?

6. (a) Explain Immediate database modification technique for log based recovery. 10
(b) Explain what is deadlock and methods for deadlock detection. 10
7. Write short notes for: (any **four**) 20
- (i) Referential Integrity
 - (ii) Aggregate functions in SQL
 - (iii) Shadow Paging
 - (iv) Checkpoints
 - (v) Triggers in SQL
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SE comp Sem IV Old: 10/06/2019
Analysis of Algorithm & Design

(OLD COURSE)

QP Code : MV-18950

(3 Hours)

[Total Marks : 100

- N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any four from remaining.
(3) Assume suitable data when required.

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|----|-----|---|----|
| 1. | (a) | Explain Quicksort Algorithm. Mention time complexity of the Algorithm. | 10 |
| | (b) | What is divide and conquer strategy ? Explain binary search method. | 10 |
| 2. | (a) | Write Algorithm for max-min using divide and conquer strategy. Give an example. | 10 |
| | (b) | Use Radix Sort Algorithm to sort the following numbers. Show all passes.
680, 645, 382, 954, 37, 700, 125, 3 | 10 |
| 3. | (a) | Give Algorithm for all pair shortest path. Derive complexity. | 10 |
| | (b) | What is graph colouring? How it is solved? Explain with example. | 10 |
| 4. | (a) | Discuss PRIM'S method of minimum cost spanning tree. | 10 |
| | (b) | What is travelling salesman problem ? Explain dynamic programming method for solving TSP. | 10 |
| 5. | (a) | What is backtracking ? How N-queens problem is solved using backtracking? | 10 |
| | (b) | Explain branch and bound method. Give an example of this method. | 10 |
| 6. | (a) | What is knapsack problem? Discuss solving knapsack problem with greedy and dynamic programming approach. | 10 |
| | (b) | Discuss Belman ford algorithm for shortest path in graph. | 10 |
| 7. | | Write short notes. | 20 |
| | (1) | Job sequencing with deadlines | |
| | (2) | Big O, Big Ω and Big θ notations | |
| | (3) | Time complexity and space complexity of Algorithms | |
| | (4) | Strassen's matrix multiplication. | |

SE Sem IV (CMPN)
ADC (old) 4/6/2014

(OLD COURSE)

QP Code : **MV-18913**

(3 Hours)

[Total Marks : 100

- N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any **four** questions from the remaining **six** questions.
(3) Assume suitable data wherever required with justification.

1. (a) Define and explain various multiplexing techniques used in the communication systems. 10
(b) What is line coding? Draw the following waveforms for the sequence b(t) - 1101010 10
(i) UZR (unipolar RZ)
(ii) AMI
(iii) Manchester
(iv) NRZ-M
(v) Polar RZ
2. (a) An A.F. signal $20\sin(2\pi \times 500t)$ is used to amplitude modulate a carrier of $50\sin(2\pi \times 10^5t)$ calculate :- 10
(i) Modulation index
(ii) Sideband frequencies
(iii) Amplitude of each sideband frequency
(iv) Bandwidth required
- (b) Compare Delta modulation, PCM and adaptive delta modulation. 10
3. (a) Draw the block diagram of a super heterodyne radio receiver and explain the working with the help of waveforms. 10
(b) Explain the following : 10
(i) Information
(ii) Information rate
(iii) Entropy
(iv) Channel capacity
A message source generates four messages every microsecond. The probabilities of these messages are 0.4, 0.3, 0.2 and 0.1. Each message is independent of the other messages. Find the entropy and rate of information.
4. (a) Explain block diagram of BPSK transmitter and receiver and find Euclidian distance for BPSK. 10
(b) State the sampling theorem for low pass signals. Draw waveforms for all types of sampling techniques. Explain aliasing effect. 10

5. (a) For a (7, 4) linear block code the generator matrix is given by, 10

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

- (i) Find all code vectors.
 (ii) Find parity check matrix
 (iii) Explain the process of error detection and correction.

- (b) Classify and explain in detail all types of noises that affect communication. 10

6. (a) Explain Ratio detector with circuit diagram and explain why ratio detector is preferred over Foster - Seeley detector for FM modulation. 10

- (b) Explain BFSK transmitter and receiver. Draw PSD for BFSK and write the BW requirement. 10

7. Write short notes on any four :- 20

- (a) Diode detector
 (b) Pre-emphasis and De-emphasis
 (c) Matched Filter
 (d) Need of modulation in communication
 (e) PWM
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Instruction:-

1. Write Five Questions Only
2. Question 1 is compulsory.
3. Each question carry equal marks and sub-question marks are equally divided.

Q1. Answer in Brief (ANY FIVE)

- I. What are the two major functions of Operating System?
- II. What is the difference between Timesharing & Multi-Programming OS?
- III. What is the purpose of System Call in OS?
- IV. What are block special and character special files?
- V. What is Kernel mode of OS?
- VI. What are Shell and Shell Script?

Q2.

- a) Draw schematic of Process State Diagram and explain each state transition.
- b) Contrast the difference between process and thread.

Q3.

- a) What are the problems associated with critical region? How to overcome the problems using semaphores?
- b) Explain scheduling strategy smallest job first and its advantages.

Q4.

- a) Assume that main memory can have 4 page frames max. Initially all are empty. Consider a sequence of 8 page size program pages loaded in the memory as follows 0,1,7,2,3,2,7,1,0,3. Draw table showing the main 4 page frame status after each page loaded. How many page faults are expected at the end of last page loaded in the memory using LRU page replacement strategy?
- b) Explain Index allocation of disk blocks with a neat diagram. What is the maximum and minimum size of file stored if block size is 1Kbytes each.? Assume that disk address is 8 bytes, i-node has 10 direct entries and one single, double and triple entries.

Q5.

- a) Explain the deadlock management techniques namely Detection, Prevention, Avoidance. What is a integrated deadlock strategy?
- b) Explain Elevator Algorithm and find seek time if disk cylinder request are in the following order 10, 22, 20, 2, 40, 6, 38. Assume disk takes 6ms per cylinder move and initial cylinder is 20.

Q6.

- a) Explain Dining Philosopher problem and give the most suitable solution to it.
- b) Write a Unix Shell Script to read a file of integers and append the file with an integer equal to last integer + 1.

Q7. Write Short Notes (ANY TWO)

- a) Segmented Paging Memory Management.
- b) Process Control Block and Process Switching.
- c) Use of Monitors for mutual exclusion.
- d) RAID or File system Journaling.