

Con. 3808-10.

(REVISED COURSE)

AN-3445

(3 Hours)

[Total Marks : 100]

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions out of remaining **six** questions.

1. a) What is an operating system? Explain in brief the different services which it provides. 10
 b) i) Explain different system calls of O.S. 05
 ii) Differentiate monolithic and layered structure of O.S. 05

2 a) Consider the following set of processes with the length of cpu burst given in Ms.

Process	Burst time	Priority
P1	10	3
P2	1	1
P3	2	4
P4	1	2
P5	5	2

The processes are assumed to have arrived in the order p1, p2, p3, p4, p5 at time 0.

- i) Draw the Gantt chart for FCFS, SJF, Priority and Round Robin (Quantum=1).
 ii) Which algorithm results in the maximum average waiting time? 10
 b) Explain multilevel queue scheduling. 10

3. a) What is deadlock? Explain various deadlock prevention techniques. 10
 b) Explain critical section problem and its different solutions. 10

4. a) Explain paging in detail. Describe how logical address converted to physical address. 10

b) Calculate Hit and Faults using various page replacement policies.(FIFO,LRU,OPT). for the following page sequence: 10

(The page frame size is 3).

2 3 5 4 2 5 7 3 8 7

5. a) Explain different techniques of disk scheduling. 10
 b) Explain process concurrency/synchronization of windows O.S. 10
 6. a) Explain file allocation in detail. 10
 b) Explain how memory management takes place in Linux. 10

7. Write short notes on :- 20
 i) Semaphore
 ii) Unix File System
 iii) Segmentation
 iv) Distributed O.S.

Con. 3335-10.

(REVISED COURSE)

AN-3448

(3 Hours)

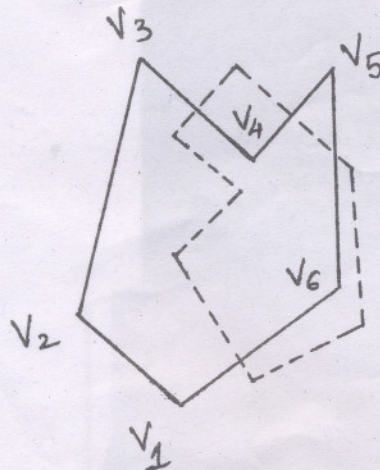
[Total Marks : 100

N.B. (1) Question No. 1 is **compulsory**.

(2) Solve any **four** from remaining i.e. Q.No.2 to Q. No. 7.

(3) **Figures** to the **right** indicate **full marks**.

1. (a) Derive decision parameters for the midpoint ellipse algorithm (Region 1), assuming the starting position is (O, r_y) and points are to be generated along the curve path in clockwise order and hence solve $r_x = 4, r_y = 3$. 10
- (b) Draw 3D transformation pipeline from modelling co-ordinates to final device co-ordinates of hence derive transformation from world co-ordinates to viewing co-ordinates. 10
2. (a) Write a boundary fill procedure to fill an 8-connected region. 5
- (b) Show transformation matrix for reflection about line $y = -x$ is equivalent to reflection relative to y - axis followed by a counterclockwise pure rotation. 5
- (c) Write about the character generation methods. 5
- (d) Show that composition of two rotations is additive by concatenating matrix. 5
3. (a) Explain Cohen-Sutherland line clipping algorithm. 10
- (b) Explain how Weiler-Atherton algorithm works for convex polygons ? Clip the following polygon using the above 10



4. (a) Discuss the segment table alongwith operations on segments. What are the other display file structures used ? 10
- (b) Solve using Liang Barsky line clipping algorithm, where $(xw_{min}, xw_{max}) = 1, 9$ and $(yw_{min}, yw_{max}) = (2, 8)$ for line Segments
 $P_1(3, 7)$ to $P_2(3, 10)$
 $P_3(6, 6)$ to $P_4(8, 9)$
 $P_5(-1, 7)$ to $P_6(11, 1)$ 10

4. (a) Discuss the segment table alongwith operations on segments. What are the other display file structures used ? 10
- (b) Solve using Liang Barsky line clipping algorithm, where $(xw_{\min}, xw_{\max}) = 1,9$ and $(yw_{\min}, yw_{\max}) = (2,8)$ for line
 Segments $P_1(3,7)$ to $P_2(3,10)$
 $P_3(6,6)$ to $P_4(8,9)$
 $P_5(-1,7)$ to $P_6(11,1)$ 10
5. (a) Derive all the necessary matrices required to perform 3D Rotation about arbitrary axis. 10
- (b) Write short note on Text Clipping Methods. 5
- (c) Differentiate Parallel and Perspective Projection. 5
6. (a) What is 3D clipping ? Derive equations for all the planes. (left, right, top, bottom, front, back). 10
- (b) Explain Sutherland Hodgeman polygon clipping algorithm. 10
7. Write short notes on :- 20
- (a) Warnock's algorithm (c) Shading algorithms
- (b) Depth Buffer algorithm (d) B-spline and Bezier Curves.
-

(3 Hours)

[Total Marks : 100

N.B. (1) Question No. 1 is **compulsory**.(2) Attempt any **four** questions from the remaining **six** questions.(3) Answer to questions should be **grouped** and written **together**.

1. (a) An AM signal appears across a 50Ω load has the following equation :— 10
 $V(t) = 12 (1 + \sin 12.566 \times 10^3 t) \sin 18.85 \times 10^6 t$ Volts.
 (i) Sketch the envelope of this signal in time domain.
 (ii) Calculate the modulation index, side band frequencies, total power and bandwidth.
- (b) Explain Ratio detector with circuit diagram and explain why Ratio detector preferred over Foster-Seeley detector for FM demodulation. 10
2. (a) Explain the transmitter and receiver for the Adaptive delta modulation system. 10
- (b) Explain : (i) Shannon Hartley capacity theorem. 5
 (ii) Shannon limit. 5
3. (a) Explain : (i) Intersymbol Interference and equalization. 8
 (ii) White Gaussian noise. 2
- (b) What is line coding ? Draw the waveforms if the sequence is transmitted using — 10
 (i) Unipolar RZ (iv) Split Phase Manchester
 (ii) Polar RZ (v) M ary where $M = 4$
 (iii) AMI
 Assume the binary sequence 1 1 0 1 0 0 1 1
4. (a) Write a short note on :—
 (i) Viterbi Algorithm 5
 (ii) Cyclic Code. 5
- (b) The generator matrix of (6, 3) systematic block code is given by — 10

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$
 (i) Find the code Vectors.
 (ii) Find the parity check matrix.
 (iii) Find the error syndrome.
5. (a) Explain the QAM Transmitter and Receiver. 10
- (b) Explain Differential Encoded PSK and also show that in DEPSK error occur in pair. 10
6. (a) State and prove the sampling theorem for Low pass filters. 10
- (b) Explain TDM and FDM. 10
7. Write short notes on any **three** of the following :— 20
 (a) Pre-emphasis and De-emphasis (c) Thermal Noise
 (b) Ring Modulator (d) Companding.

Con. 3330-10.

(3 Hours)

[Total Marks : 100

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

(2) Solve any **four** questions from remaining.

(3) Make **suitable** assumptions if needed.

1. (a) Draw an E-R diagram and reduce it to relational database model for a university database for scheduling of classrooms for final exams. This database could be modelled using entities as
exam (course_name, section_number, room_number, time);
course (name, department, C_number),
room (r_number, capacity, building).
Entity section is dependent on course. 10
(b) What is recoverable schedule ? Why recoverability of schedule is desirable ? Explain recovery with concurrent transaction ? 10
2. (a) Explain view serializability and conflict serializability with proper example ? 10
(b) Explain following terms with suitable example :— 10
(i) Primary Key (ii) Candidate Key (iii) Foreign Key (iv) Super Key.
3. (a) For the following given database, write SQL queries :—
person (driver_id #, name, address)
car (license, model, year)
accident (report_no, date, location)
owns (driver_id #, license)
participated (driver_id, car, report_number, damage_amount)
(i) Find the total number of people who owned cars that were involved in accident in 1995. 4
(ii) Find the number of accidents in which the cars belonging to "Sunil K." were involved. 3
(iii) Update the damage amount for car with licence number "Mum2022" in the accident with report number "AR2197" to Rs. 5000. 3
(b) Explain following relational algebra with suitable example :— 10
(i) Natural Join
(ii) Assignment
(iii) Set intersection
(iv) Generalized Projection.

4. (a) What is transaction ? Discuss ACID properties of transaction ? 10
(b) Define normalization ? Explain 1NF, 2NF, 3NF and BCNF ? 10
5. (a) What do you mean by deadlock ? What are various techniques for deadlock prevention and detection ? 10
(b) Explain various types of constraints with an example ? 10
6. (a) Explain Insertion of entry in B⁺ tree ? 10
(b) Explain various functions of a database Administrator ? List five responsibilities of a DBMS ? 10
7. Write short note on (any **two**) :— 20
(a) Generalization and specialization
(b) Buffer Management
(c) Security and Authorization in DBMS
(d) Hashing.
-

Con. 3804-10.

(REVISED COURSE)

AN-3452

(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 right indicate full marks.

(4) Assume any suitable data whenever required and justify the same.

1. a) Find k such that $\frac{1}{2} \log(x^2 + y^2) + i \tan^{-1} \frac{kx}{y}$ is analytic. (5)

b) If $A = \begin{bmatrix} \pi & \frac{\pi}{4} \\ 0 & \frac{\pi}{2} \end{bmatrix}$ find $\cos A$. (5)

c) Find all the basic feasible, infeasible, degenerate, non degenerate solutions of $x_1 + 2x_2 + 4x_3 + x_4 = 7$, $2x_1 - x_2 + 3x_3 - 2x_4 = 4$. (5)

d) Evaluate the line integral $\int_C (z^2 + 3z) dz$ along the straight line from $(2,0)$ to $(2,2)$ and then from $(2,2)$ to $(0,2)$. (5)

2. a) Find the eigenvalues and eigenvectors of $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. Are the eigenvectors linearly independent? (6)

b) If $f(z) = u + iv$ is analytic and $u + v = \frac{2 \sin 2x}{e^{2y} + e^{-2y} - 2 \cos 2x}$ find $f(z)$ in terms of z . (7)

c) Solve by simplex method Max $z = x_1 - x_2 + 3x_3$ (7)
Subject to the constraints $x_1 + x_2 + x_3 \leq 10$
 $2x_1 - x_3 \leq 3$,
 $2x_1 - 2x_2 + 3x_3 \leq 0$
 $x_1, x_2, x_3 \geq 0$

3. a) Show that the matrix $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ is diagonalizable. Hence find the diagonal and the transforming matrix (6)

- b) Use Big M method to solve $\text{Max } Z = x_1 + 4x_2$ (7)

Subject to the constraints $3x_1 + x_2 \leq 3$

$$2x_1 + 3x_2 \leq 6$$

$$4x_1 + 5x_2 \geq 20, \quad x_1, x_2, \geq 0$$

- c) State Cauchy's residue theorem and hence evaluate (7)

i. $\oint_C \frac{z-1}{z^2+2z+5} dz, \quad C: |z|=1.5$

ii. $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$

4. a) Prove that for the function defined by $f(z) = \frac{x^3(1+i) - y^3(1-i)}{x^2 + y^2}$ when $z \neq 0$
 $= 0$ when $z = 0$ (6)

Cauchy Riemann equations are satisfied at the origin yet $f'(0)$ does not exist.

- b) Use Principle of Duality to solve Max $z = 3x_1 + 4x_2$ (7)

Subject to the constraints $x_1 - x_2 \leq 1$

$$x_1 + x_2 \geq 4$$

$$x_1 - 3x_2 \leq 3, \quad x_1, x_2 \geq 0$$

- c) Find all possible Taylor's and Laurent series expansions of $f(z) = \frac{z-1}{z^2 - 2z - 3}$
 indicating the regions of convergence. (7)

5. a) Find the maximum or minimum of the function $Z = x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$ (6)

- b) Find the bilinear transformation which maps the points 1, -i, 2 onto the points 0, 2, -i
 and hence find the fixed points. (7)

- c) Solve by using Dual simplex method Min $z = 2x_1 + x_2$ (7)

Subject to the constraints $3x_1 + x_2 \geq 3$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \geq 3, \quad x_1, x_2 \geq 0$$

6. a) Verify Cayley Hamilton Theorem for $A = \begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix}$ and hence
 evaluate $2A^4 - 5A^3 - 7A + 6I$. (6)

- b) Evaluate $\int_C \frac{\sin z}{4z^2 - 8iz} dz$, C consists of the boundaries of the squares with vertices
 $\pm 3, \pm 3i$ (anticlockwise) and $\pm 1, \pm i$ (clockwise) (7)

- c) Using Kuhn-Tucker conditions Minimize $z = 2x_1 + 3x_2 - x_1^2 - 2x_2^2$ (7)

Subject to the constraints $x_1 + 3x_2 \leq 6, 5x_1 + 2x_2 \leq 10, x_1, x_2 \geq 0$

7. a) Find the orthogonal trajectories of the family of curves $r^2 \cos 2\theta = \alpha$. (6)

- b) Find the image of the line $\theta = \frac{\pi}{3}$ under the transformation $w = z + \frac{1}{z}$. (7)

- c) Use the method of Lagrangian multipliers to solve the following problem.

$$\text{Minimize } Z = 6x_1 + 8x_3 - x_1^2 - x_2^2$$

$$\text{Such that } 4x_1 + 3x_2 = 16$$

$$3x_1 + 5x_2 = 15, \quad x_1, x_2 \geq 0$$

(7)

Analysis of Algorithm & Design

Con. 3705-10.

(REVISED COURSE)

AN-3454

(3 Hours)

[Total Marks : 100

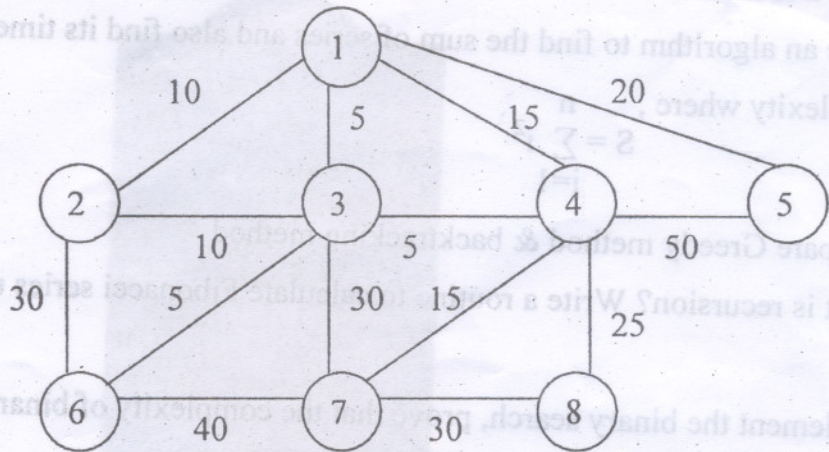
N.B. (1) Question No. 1 is **compulsory**.(2) Attempt any **four** questions from the remaining **six** questions.(3) Assumption made should be **clearly** stated.(4) Assume **suitable** data whenever **required**.

1. a) Write a routine to delete a word from a tries. 05
- b) Write an algorithm to find the sum of series and also find its time complexity where,
- $$S = \sum_{i=1}^n i^2$$
- c) Compare Greedy method & backtracking method 05
- d) What is recursion? Write a routine to calculate Fibonacci series using it. 05
2. a) Implement the binary search, prove that the complexity of binary search is $O(\log_2 N)$ 10
- b) Explain randomized version of Quick sort and evaluate its complexity with example. 10
3. a) Explain with example job sequencing with deadlines. 10
- b) Explain optimal storage on tapes with example. 05
4. a) Explain longest common subsequence with example. 10
- b) Write a note on all pairs shortest path algorithm. 10
5. a) Write & explain sum of subset algorithm, with $n=4$, $w=\{2,7,8,15\}$, $m=17$ 10
- b) Explain backtracking method to solve 0/1 knapsack problem. 10
- Find solution for $n=3$, $m=20$
- $(p_1, p_2, p_3) = (25, 24, 15)$ and $(w_1, w_2, w_3) = (18, 15, 10)$.

[TURN OVER

Con. 3705-AN-3454-10.

6. a) Find minimum cost spanning tree for the given graph figure,
using Prim's & Kruskal's Algorithm: -



- b) Explain how branch & bound method can be applied to solve 15 puzzle
using least cost search.

7. a) Implement merge sort using divide & conquer strategy.

Sort the following numbers showing output of each pass.

100, 20, 38, 14, 48, 07, 17, 57, 93, 35

- b) Find the Huffman code for the following set of frequencies based on
the first 8 Fibonacci numbers.

a = 1, b = 1, c = 2, d = 3, e = 5, f = 8, g = 13, h = 21.

(OLD COURSE)

(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) Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ along— 20

- (i) the line $x = 2y$
 (ii) the real axis from A to B and then from B to C where—
 $A \equiv (0, 0)$; $B \equiv (2, 0)$; $C \equiv (2, 2 + i)$

- (b) Prove that eigen values of a Hermitian matrix are real.
 (c) Compute a real root of $x \log_{10} x - 1.2 = 0$ correct to three places of decimal using Newton Raphson method.

- (d) Discuss the type of singularity of $f(z) = \frac{1}{z - \sin z}$ at its singularity $z = 0$. Find the residue at this point.

2. (a) Consider the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ 8

- (i) Find the eigen values and eigen vectors of A.
 (ii) Hence obtain eigen values of $\text{adj } A$ and A^{-1} .

(b) If $f(a) = \oint_C \frac{4z^2 + z + 4}{z - a} dz$ where $C : 4x^2 + ay^2 = 36$ find $f(i)$, $f(1)$, $f'(i)$. 6

(c) Using Lagrange's interpolation formula find the distance travelled by the particle at $t = 3.5$ second from the table. 6

Sec(t)	0	1	3	4
Mt/Sec	21	15	12	10

3. (a) Expand $f(z) = \frac{1}{z(z-1)(z+2)}$ in a Laurent's Series about $z = 0$ for :— 8

- (i) $0 < |z| < 1$ (ii) $1 < |z| < 2$ (iii) $|z| > 2$

(b) Using Euler's Method, find the approximate value of y where $\frac{dy}{dx} = -y$ with $y(1) = 1$, 6
 taking $h = 0.01$ at $x = 0.04$. Compare it with exact value.

(c) Solve the following system of equations by Gauss Jordan Reduction Method :— 6

$$2x + 3y + 4z = 20$$

$$4x + 3y + 2z = 16$$

$$x + 2y + z = 08$$

4. (a) Prove $\int_0^\pi \frac{d\theta}{3 + 2\cos\theta} = \frac{\pi}{\sqrt{5}}$ using Residue Theorem. 8

(b) Diagonalize the following Hermitian matrix, where $A = \begin{bmatrix} -3 & 2 + 2i \\ 2 - 2i & 4 \end{bmatrix}$ 6

Also find the transformation matrix.

(c) Compute the value of the definite integral $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x) dx$ by using — 6

(i) Trapezoidal Rule

(ii) Simpson's one Third Rule.

5. (a) (i) If $y = f(x)$ is a polynomial of the 7th degree and 4

$$y_0 + y_8 = 734$$

$$y_1 + y_7 = 524$$

$$y_2 + y_6 = 374$$

$$y_3 + y_5 = 282$$

Find y_4 assuming $\Delta^8 y = 0$.

(ii) P. T.

$$\mu^2 = 1 + \frac{\delta^2}{4}$$

(Prove that)

(μ, δ are usual notations)

(b) Define : (i) Minimal Polynomial of a Matrix, (ii) Derogatory Matrix. 8

Verify whether the matrix is derogatory $A = \begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$

(c) Evaluate the roots of $\cos x - xe^x = 0$ by bisection method in 4 steps. 6

6. (a) If $A = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$, use diagonalization to determine e^A and 5^A . 6

(b) Using Runge Kutta Method of Fourth order to find the approximate value of— 8

$$\frac{dy}{dt} = \frac{y^2 - x^2}{y^2 + x^2} \text{ given } y(0) = 1 \text{ at } x = 0.2 \text{ and } x = 0.4.$$

(c) Prove by using contour integration $\int_0^\infty \frac{dx}{x^4 + a^4} = \frac{\pi \sqrt{2}}{4a^3}$. 6

7. (a) Evaluate $\oint_C \frac{z^2}{z^4 - 1} dz$ where C is the circle :— 6

(i) $|z - 1| = 1/2$ (ii) $|z - 1| = 1$ (iii) $|z + i| = 1$

(b) (i) Express $f(x)$ into factorial polynomial when $F(x) = 2x^3 - 3x^2 + 5x - 4$ and find the function whose first difference is given function. 4

(ii) Evaluate $\Delta^2(\cos 3x)$ and $\Delta(x^2 + \sin x)$, the interval of difference being 'h'. 4

(c) (i) Examine whether the vectors— 2

$$X_1 = [3, 1, 1]^T; X_2 = [2, 0, -1]^T; X_3 = [4, 2, 1]^T \text{ are linearly independent.}$$

(ii) Find the symmetric matrix $A_{3 \times 3}$ having eigen values $\lambda_1 = 0, \lambda_2 = 3, \lambda_3 = 15$ with the corresponding eigen vectors— 4

$$X_1 = [1, 2, 2]^T; X_2 = [-2, -1, 2]^T \text{ and } X_3.$$

Con. 3340-10.

(OLD COURSE)

AN-3718

(3 Hours)

[Total Marks : 100]

N.B. (1) Question No. 1 is compulsory.

(2) Attempt **any four** questions out of the remaining.

- Q.1 (a) Distinguish between computer architecture and computer organization with the help of appropriate examples. 05
- (b) Explain the structure of the von Neumann machine. 05
- (c) Explain the basic instruction cycle with the help of an example 05
- (d) Explain the five elements of bus design. 05
- Q.2 (a) Explain the key characteristics of computer memory systems in detail. 08
- (b) List and explain in detail the three techniques for performing I/O. Also give their advantages and disadvantages. 12
- Q.3 (a) Compare and contrast the different RAID levels. 08
- (b) What is virtual memory? Describe how a virtual address generated by the CPU is translated into a physical main memory address. 12
- Q.4 (a) Explain with an example an algorithm for twos complement multiplication. 12
- (b) Explain the basic addressing modes with the help of examples. 08
- Q.5 (a) Explain in detail six-stage CPU instruction pipeline. 10
- (b) Explain the characteristics of RISC and CISC with examples. 10
- Q.6 (a) Explain Wilke's microprogrammed control unit design. 10
- (b) Explain Flynn's classification for parallel processor systems. Give examples. 10
- Q.7 Write short notes on **any four** of the following :- 20
- PCI bus
 - Locality of reference
 - Interleaved memory
 - Co-processor
 - Horizontal and vertical microinstructions
 - Demand Paging.

10 June 2016.

S.E. Com / Sem IV / Old

Analysis & Algorithms.

4-p3-upq-Con No. File

Con. 3850-10.

(OLD COURSE)

AN-3715

(3 Hours)

[Total Marks : 100]

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

- Q.1. a) Explain the notations used to represent the complexity. 10
b) Explain topological sorting with example. 10
- Q.2. a) To implement the binary search, prove that the complexity of binary search is $O(\log_2 n)$. 10
b) Write notes on tries. 10
- Q.3. a) Write a program to sort given n integer numbers using bubble sort. Drive the complexity of bubble sort. 10
b) Write note son transitive closures. 10
- Q.4. a) Write a program to delete an element from one dimensional array. What is time complexity of it? 10
b) Write functions to implement DFS and BFS graph searching methods. 10
- Q.5. a) Explain backtracking method. Develop an algorithm for finding solution to N queen problem. 10
b) What are different representation techniques for a graph? Write applications of graph data structure. 10
- Q.6. a) Explain B+ tree with an example and show how insertions can be done in it. State its applications. 10
b) Explain AVL tree. Its left and right rotation with example. 10
- Q.7. a) Explain in detail collision handling techniques in Hashing. 10
b) Explain heap sort with example. 10

IV / Old / Comp.

26/5/2010

Con. 3316-10.

(OLD COURSE)

D.S.

AN-3706

(3 Hours)

[Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** questions out of remaining **six** questions.

(3) Make **suitable** assumptions if **needed**.

1. (a) Explain the insertion entry in B+ tree. 6
(b) Compare file processing system and DBMS. 6
(c) Describe :- 8
 - (i) Different types of DBMS users.
 - (ii) Three Layers of data Abstraction.
2. (a) What is data independence ? 8
Give one example each of logical and physical data independence.
(b) Explain multigranularity locking protocol. 6
(c) Illustrate any two join operators with simple example of each. 6
3. (a) Justify the following statement with example, "Every conflict serializable schedule is view serializable". 8
(b) Explain Time Stamp based Concurrency Control. 8
(c) Describe Hash based storage organization. 4
4. (a) Draw ER Diagram of Banking Enterprise. Make suitable Business Rules and assumptions Convert ER diagram into tables. 10
(b) Describe 2NF, 3NF and BCNF with examples. Decompose 2NF table into 3NF tables with examples. Decompose 3NF table into BCNF tables with examples. 10
5. (a) What is recoverable schedule ? Why recoverability of schedule is desirable ? Explain checkpoint based recovery mechanism. 10
(b) What is view ? What are benefits and limitation of a view ? What are updatable views ? 6
(c) Explain any two Relational Algebra Operators. 4

6. (a) From a supplier database, one table with details of the orders is shown below – 12

Orders (O-Id, OrderDate, OrderPrice, Customer). Underlined field is a primary key.

Write SQL queries for :-

- (i) Find the customers that have an OrderPrice value higher than the average OrderPrice value.
- (ii) How many orders are placed by customer "David".
- (iii) Find the largest value of the "OrderPrice" column.
- (iv) Find the total sum (total order) of each customer.
- (v) Find if any of the customers have a total order of less than 2000.
- (vi) Find if customer "Kishan" or "Raj" have total order of more than 1500.

(b) What do you understand by deadlock in database systems. Discuss one protocol that prevents dealock. 8

7. Write short notes on any **four** :- 20

- (a) Triggers
- (b) Assertions
- (c) Shadow Paging
- (d) Integrity Constraint
- (e) Serializability.

1. (a) Explain the insertion entry in B+ tree. 6
 (b) Compare file processing system and DBMS. 6
 (c) Describe :- 8
 - (i) Different types of DBMS users.
 - (ii) Three Layers of data Abstraction.
2. (a) What is data independence ? 8
 Give one example each of logical and physical data independence.
 (b) Explain multigranularity locking protocol. 6
 (c) Illustrate any two join operators with simple example of each. 6
3. (a) Justify the following statement with example, "Every conflict serializable schedule is view serializable". 8
 (b) Explain Time Stamp based Concurrency Control. 8
 (c) Describe Hash based storage organization. 4
4. (a) Draw ER Diagram of Banking Enterprise. Make suitable Business Rules and assumptions Convert ER diagram into tables. 10
 (b) Describe 2NF, 3NF and BCNF with examples. Decompose 2NF table into 3NF tables with examples. Decompose 3NF table into BCNF tables with examples. 10
5. (a) What is recoverable schedule ? Why recoverability of schedule is desirable ? Explain checkpoint based recovery mechanism. 10
 (b) What is view ? What are benefits and limitation of a view ? What are updatable views ? 6
 (c) Explain any two Relational Algebra Operators. 4
6. (a) From a supplier database, one table with details of the orders is shown below 12
 Orders (O-Id, OrderDate, OrderPrice, Customer). Underlined field is a primary key.
 Write SQL queries for :-
 - (i) Find the customers that have an OrderPrice value higher than the average OrderPrice value.
 - (ii) How many orders are placed by customer "David".
 - (iii) Find the largest value of the "OrderPrice" column.
 - (iv) Find the total sum (total order) of each customer.
 - (v) Find if any of the customers have a total order of less than 2000.
 - (vi) Find if customer "Kishan" or "Raj" have total order of more than 1500.
- (b) What do you understand by deadlock in database systems. Discuss one protocol that prevents dealock. 8
7. Write short notes on any **four** :- 20
 - (a) Triggers
 - (b) Assertions
 - (c) Shadow Paging
 - (d) Integrity Constraint
 - (e) Serializability.