

(OLD COURSE)

QP Code: **4047**

(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) Find the eigen values of $A^3 - 3A^2 + A$, where

5

$$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -i & -4 & -3 \end{bmatrix}$$

- (b) Determine the constants a, b, c and d if

5

$f(z) = (x^2 + 2axy + by^2) + i(cx^2 + 2dxy + y^2)$ is analytic function.

- (c) Evaluate $\int_0^{1+i} (x - y + ix^2) dz$ along the parabola $y^2 = x$.

5

- (d) Obtain the dual of the following L.P.P.

5

$$\begin{aligned} \text{Maximise} \quad & z = x_1 - 2x_2 + 3x_3 \\ \text{subject to} \quad & -2x_1 + x_2 + 3x_3 = 2 \\ & 2x_1 + 3x_2 + 4x_3 = i \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

2. (a) Find the eigen values and eigen vectors of $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$.

6

- (b) Find an analytic function $f(z)$ whose imaginary part is $e^{-x}(y \sin y + x \cos y)$.

6

- (c) Using duality solve the following L.P.P.

8

$$\begin{aligned} \text{Minimise} \quad & z = 4x_1 + 14x_2 + 3x_3 \\ \text{subject to} \quad & -x_1 + 3x_2 + x_3 \geq 3 \\ & 2x_1 + 2x_2 - x_3 \geq 2 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

[TURN OVER]

3. (a) Evaluate $\int_c \frac{ze^z}{(z-a)^3} dz$, where c is $|z|=b$, ($a < b$). 6

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

(c) Solve the following L.P.P. by Simplex method 8

$$\begin{aligned} &\text{maximise} && z = 5x_1 + 4x_2 \\ &\text{subject to constraint} && 6x_1 + 4x_2 \leq 24 \\ &&& x_1 + 2x_2 \leq 6 \\ &&& -x_1 + x_2 \leq 1 \\ &&& x_2 \leq 2 \\ &&& x_1, x_2 \geq 0 \end{aligned}$$

4. (a) Show that $u = \left(r + \frac{a^2}{r} \right) \cos \theta$ is a harmonic functions and find it's harmonic conjugate. 6

(b) Use the dual simplex method to solve the following L.P.P. 6

$$\begin{aligned} &\text{Minimise} && z = 6x_1 + x_2 \\ &\text{subject to} && 2x_1 + x_2 \geq 3 \\ &&& x_1 - x_2 \geq 0 \\ &&& x_1, x_2 \geq 0 \end{aligned}$$

(c) Verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$ hence find A^{-1} and A^4 . 8

5. (a) Show that $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is diagonalisable. Find the transforming matrix and the diagonal matrix. 6

(b) Obtain Taylor's and Laurent's series for $f(z) = \frac{z-1}{z^2-2z-3}$ indicating the region of convergence. 6

[TURN OVER

- (c) Solve the following N.L.P.P. by Lagranges's Multiplier's Method. 8

Optimise $z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$

subject to $x_1 + x_2 + x_3 = 20$

$x_1, x_2, x_3 \geq 0$

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

- (b) Find the bilinear transformation which maps the points 1, -i, 2 of z plane onto 0, 2, -i of w plane respectively. 6

- (c) Evaluate $\int_0^{\pi} \frac{d\theta}{3+2\cos\theta}$ using Cauchy Residue theorem. 8

7. (a) Evaluate $\int_C \frac{z+4}{z^2+2z+5} dz$, where C is 6

(i) $|z+1-i|=2$

(ii) $|z|=1$

- (b) Find the image of the circle $(x-3)^2+y^2=2$ under the transformation $w = \frac{1}{z}$. 6

- (c) Use Kuhn-Tucker conditions to solve the following N.L.P.P. 8

Maximise $z = 8x_1 + 10x_2 - x_1^2 - x_2^2$

subject to $3x_1 + 2x_2 < 6$

$x_1, x_2 > 0$

3Hrs.

100 Marks

- N.B.:** (1) Question 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.

1a	Consider a AIRLINE Reservation System a) Draw ER diagram .Assume Suitable b) Convert the ER diagram into equivalent schema	10
1b	Explain the following terms with example (i) Strong Entity Set (ii) Project operator in relational algebra (iii) Primary Key (iv) Left outer join (v) TCL	10
2a	<i>employee (employee-name, street, city)</i> <i>works (employee-name, company-name, salary)</i> <i>company (company-name, city)</i> <i>manages (employee-name, manager-name)</i> a) Create relations employee and works b) Add a new employee to the database; assume any values for required attributes. c) Delete the works details for the employee "Sachin Parkar". d) Find all employees in the database who do not work for State Bank of India e) Find the company that has the most employees.	10
2b	Explain the 3-Tier ANSI-SPARC architecture	10
3a	<i>employee (person-name, street, city)</i> <i>works (person-name, company-name, salary)</i> <i>company (company-name, city)</i> <i>manages (person-name, manager-name)</i> 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 Rs10,000 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	10

3b	Explain View Serializability with example	10
4a	i. Compute the closure of the following set F of functional dependencies 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	5
	ii. Explain Third Normal Form and BCNF with example	5
4b	Explain B+ tree with examples of various operation(insertion,deletion)	10
5a	Explain timestamp ordering protocol	10
5b	Consider the following two transactions: $T31$: 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?	10
6a	Explain Immediate database modification technique for log based recovery	10
6b	Explain what is deadlock and methods for deadlock detection	10
7	Write short notes for: (Any four): i. Referential Integrity ii. Aggregate functions in SQL iii. Shadow Paging iv. Checkpoints v. Triggers in SQL	20

(OLD COURSE)

QP Code :4054

(3 Hours)
[OLD] [R-2007]

[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 Z-buffer algorithm 5
(d) Clearly differentiate between random scan and raster scan system. 5
2. (a) What is 3D clipping? Derive equations for all the planes (left , right , top , bottom, front , back) 10
(b) Derive the mathematical equations for Bresenham's line drawing algorithm. 10
3. (a) Define fractals ? Give classification of fractals. What is fractal dimension? 10
(b) Explain Cohen Sutherland Line clipping algorithm. 10
4. (a) Explain computer assisted animation and frame-by-frame animation. 10
(b) What do you understand by parallel & perspective projection. 10
5. (a) Explain Warnock's method of area subdivision method to remove hidden surface. 10
(b) Compare boundary fill and flood fill algorithm. Illustrate one example with Diagram. 10
6. (a) Draw matrices for representing three basic transformations and show that two successive rotations are additive, i.e, $R(\theta_1) * R(\theta_2) = R(\theta_1 + \theta_2)$. 10
(b) Explain Mid-Point Ellipse algorithm along this explain all mathematical derivation. 10
7. Write short notes on following (Any four) 20
 - a) Shading Algorithms
 - b) Antialiasing Technique
 - c) Dithering Technique
 - d) Character generation method
 - e) B-spline and Bezier Curve

S.E. (SEM IV) (OLD)

CE. Comp S.E. (SEM IV) (OLD)

OPERATING SYSTEM

DT 12/06/15

(OLD COURSE)

Q.P. Code : 4062

(3 Hours)

[Total Marks : 100

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

(2) Out of remaining questions, attempt any four questions.

(3) Assume suitable data wherever required but justify the same.

(4) All questions carry equal marks.

(5) Answer to each new question to be started on a fresh page.

(6) Figure to the right in brackets indicate full marks

1. (a) Draw the architecture of RTOS and explain the function of each block. 10
- (b) What is the use of system calls FORK()? Explain it with its syntax. Give one illustration. 10
2. (a) What is PCB? How and where OS use it? 10
- (b) Explain various page replacement policies. Implement LRU, OPT, FIFO for the page frame sequence 0,1,2,1,4,2,3,7,2,1,3,4,7,5,3,2,7 where page frame size is 4. Also calculate the hit ratio. 10
3. (a) What is ZOMBIE? How it is removed? 10
- (b) What are the various file structures? Explain each one in detail. 10
4. (a) Explain any shortest seek disk scheduling algorithm with an example. 10
- (b) What is the virtual memory? Explain with neat diagram the translation of virtual address into physical address in a segmentation/paging system. 10
5. (a) Explain deadlock prevention and avoidance techniques. 10
- (b) Why there is need for communication between two processes? Explain various modes of communication. 10
6. (a) Explain Double Buffering with an example. 10
- (b) Explain how file-systems store files in a linked-list fashion. What are the limitations? and advantages of this approach? 10
7. Write Short note on (any two). 20
 - (a) Applications of NOS.
 - (b) Micro Kernels.
 - (c) System Call for Directory Listing.
 - (d) Resource Graph Models.
 - (e) Inode Structure.