MCA 2nd Semester Examination, 2025

MCA

(*Optimization Technique*)

PAPER — MCA-205

Full Marks : 100

Time : 3 hours

Answer **all** questions

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

GROUP — A

Answer any **five** questions :　　　　2×5

1. If true value $= 25.00$, measured value $= 24.25$ then Find the percentage error.

2. State the difference between Gauss-Seidel and Gauss-Jacobi methods.

3. What is the difference between interpolation and extrapolation ?

4. What is the difference between a feasible solution and an optimal solution ?

5. What do you mean by unconstrained optimization technique ?

6. What is meant by a bounded solution in linear programming ?

7. State Euler's method.

8. What do you mean by genetic algorithm.

GROUP – B

Answer any **four** questions : 15×4

9. Deduce the Newton Backward interpolation formula. Using the Newton forward interpolation formula find $f(3.5)$ from the table :

8 + 7

x	1	2	3	4	5
$f(x)$	0	7	26	63	124

10. Deduce the Trapezoidal formula to find the area of an equation $f(x)$ from Newton Quadrature formula. Find

$$\int_0^{\pi/2} \sqrt{\cos x}\, dx$$

By Simpson's 1/3 and trapezoidal formula by taking 6 intervals.

7 + (4 + 4)

11. Find a real root of the equation $3x - \cos x - 1 = 0$ using Newton Raphson method. Find $\sqrt[7]{13}$ using Newton Raphson formula, correct up to 4th decimal places.

8 + 7

12. Find the value of $\dfrac{dy}{dx} = \dfrac{y-x}{1+x}$ given $y(0) = 1$,

find $y(0.1)$ by taking $h = 0.02$ by Runge Kutta 4th order formula.

Solve the system of equations using Gauss-Seidel Method

$$5x_1 - 2x_2 + 3x_3 = -1$$

$$-3x_1 + 9x_2 + x_3 = 2$$

$$2x_1 - x_2 - 7x_3 = 3$$

Obtain the result correct to three decimal places. $8 + 7$

13. (a) Solve the following LPP by the simplex method :

Maximize : $Z = 5x_1 + 3x_2$

subject to $x_1 + x_2 \leq 2$,

$$5x_1 + 2x_2 \leq 10,$$

$$3x_1 + 8x_2 \leq 12,$$

$$x_1, x_2 \geq 0.$$

(b) Obtain the dual LP problem of the following primal LP problem :

(*Continued*)

Minimize $Z_x = 3x_1 - 2x_2 + 4x_3$
subject to the constraints

(i) $3x_1 + 5x_2 + 4x_3 \geq 7,$

(ii) $6x_1 + x_2 + 3x_3 \geq 4,$

(iii) $7x_1 - 2x_2 - x_3 \leq 10$

(iv) $x_1 - 2x_2 + 5x_3 \geq 3,$

(v) $4x_1 + 7x_2 - 2x_3 \geq 2$

and $x_1, x_2, x_3 \geq 0.$ $10 + 5$

14. (a) Determine the initial basic feasible solution
for the following transportation problem
by VAM method.

	D1	D2	D3	D4	Supply
S1	3	1	7	4	300
S2	2	6	5	9	400
S3	8	3	3	2	500
Demand	250	350	400	200	

(b) Use the graphical method to solve the following LP problem :

Maximize $z = 8x_1 + x_2$

Subject to $x_1 + x_2 <= 40$

$$2x_1 + x_2 <= 60$$

x_1 and $x_2 >= 0$ 8 + 7

15. (a) Use the Big-M methods to solve the following LP problem :

Minimize $Z = x_1 - 2x_2$

Subject to $x_1 + x_2 >= 2$

$$-x_1 + x_2 >= 1$$
$$0x_1 + x_2 <= 3$$
$$x_1 \text{ and } x_2 >= 0$$

(b) Find the optimal assignments for the assignment problem with the following cost matrix :   8 + 7

	M1	M2	M3	M4
J1	20	36	31	17
J2	24	32	40	12
J3	22	40	38	18
J4	36	39	35	16

16. (*a*) Briefly describe Kuhn-Tucker conditions in non-linear programming.

(*b*) Find all eigenvalues and corresponding eigenvectors for the following matrix :

$$5 + 10$$

$$\begin{pmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{pmatrix}.$$

[Internal Assessment — 30 Marks]