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Dec.-22-0145

MA-401 (Optimization and Calculus of Variations)
(Common for B.Tech. all Branches)
B. Tech. 4th (CBCS)

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five Questions in all. Selecting One Question from each section A, B, C and D. Section E is Compulsory.

SECTION - A

1. Using duality solve the problem : Maximize $Z = 2x + y$ subject to $x + 2y \leq 10$, $x + y \leq 6$, $x - y \leq 2$, $x - 2y \leq 1$, $x, y \geq 0$. (10)

2. Solve the following LPP by Simplex Method.

   Maximize $Z = 5x + 3y$ subject to $x + y \leq 2$, $5x + 2y \leq 10$, $3x + 8y \leq 12$ and $x, y \geq 0$. (10)

SECTION - B

3. Solve the following assignment problem represented by the matrix:

	I	II	III	IV	V
A	6	5	8	11	16
B	1	13	16	1	10
C	16	11	8	8	8
D	9	14	12	10	16
E	10	13	11	8	16

(10)

4. Solve the following transportation problem:

Sources	Destination			Supply
	X	Y	Z	
A	2	7	4	50
B	3	3	7	70
C	5	4	1	80
D	1	6	2	140
Demand	70	90	180	340

(10)

SECTION - C

5. Draw a network diagram on the basis of the following data:

Activity	Duration (Days)	Activity	Duration (Days)
1-2	2	4-8	8
1-4	2	5-6	4
1-7	1	6-9	3
2-3	4	7-8	3
3-6	1	8-9	5
4-5	5	9-10	2

Find the critical path, total duration and slack times. (10)

6. Solve the non-linear programming problem. Maximize $Z = -x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$ subject to the constraints $x_1 + x_2 \leq 2$, $2x_1 + 3x_2 \leq 12$; $x_1, x_2 \geq 0$. (10)

SECTION - D

7. (i) Solve the Euler's equation for the functional: $\int_{x_0}^{x_1}(x + y')y'dx$. (5)

(ii) Find the extremals of the functional $\int_{x_0}^{x_1}\left(\frac{y'^2}{x^3}\right)dx$. (5)

(8) (i) Prove the geodesics on a right circular cylinder of radius a. (5)

(ii) Find the plane curve of fixed perimeter and maximum area. (5)

SECTION - E
(Compulsory Question)

9. (i) Define optimization problem.

(ii) Define linear programming problem.

(iii) Define basic variables.

(iv) Define assignment problem.

(v) Define convexity.

(vi) Define basic feasible solution.

(vii) Define optimal solution.

(viii) Define duality.

(ix) Define geodesics.

(x) Define Euler's equation. (10×2=20)