

- (a) Construct PERT network.
 (b) Complete T_E, T_L for each event.
 (c) Find the critical path. 15

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 :

$$\begin{aligned} x_1 + x_2 &\leq 2, \\ 2x_1 + 3x_2 &\leq 12, \\ x_1, x_2 &\geq 0. \end{aligned} \quad 15$$

Section D

7. (i) Prove that the shortest distance between two points in a plane in a straight line. 7.5
 (ii) On which curve the functional :

$$\int_0^{\frac{\pi}{2}} (y'^2 - y^2 + 2xy) dy$$

with $y(0) = 0$ and $y\left(\frac{\pi}{2}\right) = 0$ be extremized ?

7.5

8. (i) Find the plane curve of fixed perimeter and maximum area. 7.5

Roll No.

Total Pages : 05

Sep-21-00043

B. Tech. EXAMINATION, 2021

Semester IV (CBCS)

OPTIMIZATION AND CALCULUS OF VARIATIONS
 (CE, ME, AE, ECE, EE, EEE, CSE, IT)

MA-401

Time : 2 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. 9 is compulsory.

Section A

1. Solve the following LPP by Simplex method :

Maximize : $Z = 3x + 2y + 5z$

Such that : $x + 2y + z \leq 430,$
 $3x + 2z \leq 460,$
 $x + 4y \leq 420,$
and $x, y, z \geq 0.$ **15**

2. (i) Solve the following LPP :
Maximize : $Z = 6x_1 + 8x_2$
Subject to constraints :
 $30x_1 + 20x_2 \leq 300,$
 $5x_1 + 10x_2 \leq 110,$
where $x_1, x_2 \geq 0.$ **7.5**
- (ii) What are the steps involved for mathematical formulation of a Linear Programming Problem ? **7.5**

Section B

3. Solve the following transportation problem : **15**

		Destination				
		A	B	C	D	
Source	I	21	16	25	13	11
	II	17	18	14	23	13
	III	33	27	18	41	19
Requirement		6	10	12	15	43
						Availability

4. Five jobs are to be processed and five machines are available. Any machine can process any job with resulting profit (in Rs.) as follows :

Machines →

Jobs ↓	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

Find assignment pattern to maximize the profit. **15**

Section C

5. A project schedule has the following characteristics :

Activity	Time	Activity	Time
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

- (ii) Show that the geodesics on a plane are straight lines. 7.5

(Compulsory Question)

9. (i) Define Linear Programming.
(ii) Define duality.
(iii) Define Artificial basis.
(iv) Define non-linear programming problem.
(v) Define CPM.
(vi) Define geodesics.
(vii) Define objective function.
(viii) Define feasible solution.
(ix) Define functional.
(x) Define decision variable. **1.5×10=15**