[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2068)

18033(M)

B. Tech 4th Semester Examination

Optimization and Calculus of Variations (CBS)

MA-401

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 question in all, selecting one question from each Sections A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) Maximize $Z = 3x + 2y$,

Subject to $-2x+3y \leq 9$; $3x-2y \leq 20$; $x, y \geq 0$

By graphical method. (6)

(b) Explain the following concepts in the context of linear programming:

(a) Objective function

(b) Convex polygon

(c) Feasible solution. (6)

2. Use simplex method to solve the following problem:

Maximize $Z = 2x_1 + 5x_2$,

subject to $x_1 + 4x_2 \leq 24$,

$3x_1 + x_2 \leq 21$,

$x_1 + x_2 \leq 9$,

$x_1, x_2 \geq 0$ (12)

SECTION - B

3. Solve the following Linear programming by the method of dynamic programming:

Maximize $Z = 50x_1 + 100x_2$,

subject to $10x_1 + 5x_2 \leq 2500$,

$4x_1 + 10x_2 \leq 2000$,

$x_1 + 1.5x_2 \leq 450$,

$x_1, x_2 \geq 0$ (12)

4. Find the optimum solution of the following transportation problem in which the cells contain the transportation cost in rupees.

	w_1	w_2	w_3	w_4	w_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	100 (total)

(12)

SECTION - C

5. Consider the Non Linear Programming Problem:

Maximize $Z = 2x_1^2 - 24x_1 + 2x_2^2 - 8x_2 + 2x_3^2 - 12x_3 + 200$

By separating this function into three one variable functions, show that the function is convex. Solve the problem by solving each one variable function by calculus. (12)

[P.T.O.]

6. The utility data for a network are given below. Determine the total, free, independent and interfering floats and identify the critical path:

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	2	8	10	6	3	3	7	5	2	8

(12)

SECTION - D

7. (a) Find the extremal of the functional $I=\int_0^{\pi}\left[(y')^2-y^2\right]dx$ under the conditions $y(0)=0$, $y(\pi)=1$ and subject to constraints $\int_0^{\pi} ydx=1$. (6)

   (b) Show that the geodesics on the right circular cylinder of radius a. (6)

8. Prove that the sphere is the solid figure of revolution which, for a given surface area, has maximum volume. (12)

SECTION - E

9. Attempt all the questions:

   (a) Write the two applications of networking techniques.

   (b) Distinguish between PERT and CPM.

   (c) Explain the term unbalanced assignment problem with example.

   (d) Define transportation model.

   (e) Define the term well defined objective function.

   (f) Explain the term SURPLUS variables with example.

(g) What is cycling? Give examples.

(h) Define extremum of function.

(i) Prove that the shortest distance between two points in a plane is a straight line.

(j) Write two properties of convexity function.

(k) State Bellman's Principle of optimality.

(l) Explain the meaning of duality in Linear programming.

(1×12=12)