

Time: 3 Hours

Max. Marks: 60

**Instructions:**

- i) Part A is compulsory Question for 20 marks.
- ii) Part B consists of five questions with “either” “or” pattern. The student has to answer any one. However students have to answer five questions from Part B (numbered from 2 to 6)

**PART - A**

(Answer all sub questions)

**5 × 4 marks = 20**

- 1.a) What is the difference between Fibonacci and golden section methods?
- b) What are the characteristics of a direct search method?
- c) How is the degree of difficulty defined for a constrained geometric programming problem?
- d) Explain about the parametric programming in the sensitivity analysis.
- e) What is a branch and bound method?

**PART - B****5 × 8 marks = 40****Answer either “a” or “b” from each question**

- 2.a) Find the minimum of  $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$  by the cubic interpolation method.

**OR**

- b) Find the minimum of the function  $f = \lambda / \log \lambda$  take the initial trail step length as 0.1 by using cubic interpolation method.

- 3.a) Minimize  $f = x_1^2 + 3x_2^2 + 6x_3^2$  by the Hookes-jeeves method by taking  $\Delta x_1 = \Delta x_2 = \Delta x_3 = 0.5$  and starting point as (2, -1, 1) perform two iterations.

**OR**

- b) Minimize  $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$  from the starting point  $X_1 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$  using Powell's method.

- 4.a) A fertilizer company needs to supply 50 tons of fertilizer at the end of the first month. 70 tons at the end of second month, and 90 tons at the end of third month. The cost of producing  $x$  tons of fertilizer in any month is given by  $\$(4500x + 20x^2)$ . It can produce more fertilizer in any month and supply it in the next month. However, there is an inventory carrying cost of \$400 per ton month. Find the optimal level of production in each of the three periods and the total cost involved by solving it as an initial value problem.

**OR**

- b) Solve the following LP problem by dynamic programming Maximize  
 $f(x_1, x_2) = 10x_1 + 8x_2$  subjected to  
 $2x_1 + x_2 \leq 25$ ,  $3x_1 + 2x_2 \leq 45$ ,  $x_2 \leq 10$   
 $x_1 \geq 0, x_2 \geq 0$ .
- 5.a) A manufacturer produces four products A, B, C and D by using two types of machines (lathes and Milling machines). The time required on the two machines (lathes and milling machines). The times required on the two machines to manufacture 1 unit of each of the four products, the profit per unit of the product, and the total time available on the two types of machines per day are given below

machine	Time required per unit (min for product)				Total time Available per day(min)
	A	B	C	D	
Lathe machine	7	10	4	9	1200
Milling machine	3	40	1	1	800
Profit per unit(\$)	45	100	30	50	

Find the number of units to be manufactured of each product per day for maximizing the profit by using the sensitivity analysis method.

**OR**

- b) Records of 100 truck loads of finished jobs arriving in a departments check out area show the following.  
 Checking out takes 5 minutes and checker take care of only one truck at a time.  
 The data is summarized in the following table

Truck interval time	1	2	3	4	5	6	7	8	9	10
frequency	1	4	7	17	31	23	7	5	3	2

As soon as the trucks are checked out, the truck drivers take them to the next departments, using simulation method

- What is the average waiting time before service?
  - What is likely to be the longest wait time?
- 6.a) Design a helical spring for minimum weight subject to a constraint on the shear stress  $\tau$  induced in the spring under a compressive load P by using stochastic geometric programming.

**OR**

- b) Find the solution of the following method using the branch and bound method  
 Maximize  $F = x_1 - 4x_2$  subjected to  
 $x_1 - x_2 \geq -4$ ,  $4x_1 + 5x_2 \leq 45$   
 $5x_1 - 2x_2 \leq 20$ ,  $5x_1 + 2x_2 \geq 10$   
 $x_i \geq 0$  and integer  $i=1,2$ .

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