

Code No: 56021

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, December - 2017

ENGINEERING OPTIMIZATION

(Common to AE, ME)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

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1.

$$\text{Max } f(x) = \begin{cases} \frac{x}{2} & \text{for } x \leq 2 \\ -x+3 & \text{for } x > 2 \end{cases}$$

With the interval of uncertainty (0, 3) by using the Fibonacci method. Take as N=6 and calculate the accuracy achieved after conducting all the experiments. [15]

2.a) State the necessary and sufficient conditions for single variable non-linear optimization problems.

b) Examine the following functions for extreme points. [7+8]

$$f(x) = 4x^4 - x^2 + 5$$

3. Using the Rosenbrock's method, Min $Y=2+(x_1^2-x_2)^2+x_2^2$. Take starting point as (-3, -4) and $s_1=s_2=0.5$. Show calculations for complete two cycles. [15]

4.a) State the limitations of simple gradient based direction methods.

b) Using the variable metric method, find the minimum of the function
Min $f(x) = x_1^2 - x_1x_2 + 3x_2^2$. Take initial point as [1, 2]. Show calculations only for two cycles. [7+8]

5. Using Beal's method solve the following quadratic programming problem: [15]

$$\text{Min } y = -4x_1 + x_1^2 - 2x_1x_2 + 2x_2^2 \quad \text{st}$$

$$2x_1 + x_2 \geq 6, \quad x_1 - 4x_2 \geq 0 \quad x_i \geq 0 \forall i$$

6.a) State the arithmetic-geometric inequality theorem. Using it to derive the dual problem for unconstrained Geometric programming problem.

b) Design an oil storage tank (open rectangular) for the minimum cost. The materials for the bottom, side and ends cost C_1 , C_2 and C_3 units per sq.m respectively. It costs C_4 for each trip of transportation of V volume of material. [7+8]

7. Solve the following LPP problem by big M method and study the effect of changing the objective function constants to [5, 3, 7]. [15]

$$\text{Max } Z = 4x_1 + 3x_2 + 5x_3$$

$$\text{st } x_1 + 3x_2 + 2x_3 \leq 10$$

$$2x_1 + 2x_2 + x_3 \geq 6$$

$$x_1 + 2x_2 + 3x_3 = 14, \quad x_i \geq 0$$

8. A company manufactures 30 items per day. The sale of these items depend upon demand which has the following distribution:

Sales(units)	Probability
27	0.1
28	0.15
29	0.20
30	0.35
31	0.15
32	0.05

The production cost and sale price of each unit are Rs.40 and Rs 50 respectively. Any unsold product is to be disposed off at the end of the day at a loss of Rs.15 per unit. There is a penalty of Rs 5 per unit if the demand is not met. Using the following random Numbers, estimate total profit/ loss for the company for the next 10 days:10,99,65,99,95,01,79,11,16,20. If the company decides to produce 29 items per day, is it advantage or disadvantage to the company? [15]

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