R15

Code No: 5221AK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech I Semester Examinations, February - 2016
ADVANCED OPTIMIZATION TECHNIQUES AND APPLICATIONS
(Thermal Engineering)

Time: 3hrs **Max.Marks:75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

1.a) State the limitations of Fibonacci method. [5]
b) Explain steps involved in steepest descent method. [5]
c) State the arithmetic-geometric in equality theorem. How is it used in geometric programming optimization? [5]
d) Explain how the changes in constraint constants affect the optimal solution of LPP. [5]
e) Explain the steps involved in branch-bound technique method. [5]

PART - B

5 × 10 Marks = 50

2.a) Find the min of $y = 6x^4-3x+7$ over interval (0, 2) by using Fibonacci method within 10% of initial range. Show calculations for the maximum of six cycles. Calculate the achieved accuracy.
b) Did you face the problem of locating the last experiment in the above Method? If so state the problem and explain the procedure to resolve it. [5+5]

OR

3. Min $f(x) = 8x^3-2x^2-7x+3$ take to = 0.2. Solve it by Quadratic Interpolation Method. Show calculations only for two cycles. [10]

4. Using Powell's method, Min $Y=2+(x_1^2-x_2)^2+x_2^2$. Take starting point as (-3,-4). Show calculations for complete two cycles. [10]

OR

5.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. [5+5]

6. Solve the following GP problem
$Min\ f(x) = 16x_1x_2x_3 + 4x_1x_2^{-1} + 2x_2x_3^{-2} + 8x_1^{-3}x_3$ where $x_i > 0$ [10]

OR

7. A company has to transport some goods from city A to city J. The cost of transportation between the different cities is given in the following network. Find the optimal route connecting cities A and J. [10]

	B	C
A	5	4

	D	E	F
B	4	3	-
C	-	2	6

	G	H	I
D	3	6	-
E	5	7	8
F	-	9	9

	J
G	7
H	3
I	8

8. Solve the following Linear Programming Problem (LPP) and find the effect of change in coefficients of objective function to [5, 6, 8]

$Max\ Z = 4x_1 + 6x_2 + 2x_3$ *st*

$4x_1 - 4x_2 \le 5; -x_1 + 6x_2 \le 5; -x_1 + x_2 + x_3 \le 5$

$x_i \ge 0$ [10]

OR

9. A newspaper boy buys paper for Rs 2 rupee and sells them for Rs.3.00 each. He cannot return unsold newspapers. Daily demand has the following distribution.

No. of customers	23	24	25	26	27	28	29	30	31	32
Probability:	0.01	0.03	0.06	0.1	0.20	0.25	0.15	0.10	0.05	0.05

Simulate the system for 10 days and estimate average profit per day if he orders 30 papers per day. Take random numbers as 82 89 78 24 53 61 18 45 04 23 [10]

10. $Max\ Z = x_1 + 4x_2$

st $2x_1 + 4x_2 \le 7, 5x_1 + 6x_2 \le 15, x_i \ge 0\ \forall i$ *and*

Integers. Solve it by branch bound algorithm. [10]

OR

11. Mass-produced items always show random variation in their dimensions due to small unpredictable and uncontrollable disturbing influences. Suppose that the diameter X of the bolts manufactured in a production shop follow the distribution.

$$f_X(x) = a(x-0.9)(1.1-x) \text{ for } 0.9 \le x \le 1.1$$
$$= 0 \quad \text{otherwise}$$

Find the values of a, μ_X and σ_X^2 [10]

---ooOoo---