Code No: C2101 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I - Semester Examinations, April/May 2012
OPTIMIZATION TECHNIQUES AND APPLICATIONS
(THERMAL ENGINEERING)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks
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1.a) Mention the characteristics of Fibonacci method.
b) Min $f = x^2 - 10e^{0.1x}$ in the interval (-10, 5) to the accuracy of 10%. Use Fibonacci Method. Calculate the actual accuracy achieved.

2.a) Define the gradient of the function. Explain its importance in the multi variable optimization.
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].

3.a) Define Posynomial function.
b) Min $f = 4x_1x_2^2x_3^3 + x_1^{-2}x_3^2$ st $6x_1^{-1}x_2^{-1}x_3^{-1} + 4x_2^{-3}x_3^{-9} \leq 5$. $x_i > 0$

4. Find the shortest path from A to E in the following network using Dynamic Program.

	B1	B2	B3
A	2	2	2

	C1	C2
B1	3	4
B2	4	-
B3	5	2

	D1	D2
C1	-	2
C2	5	3

	E1
D1	3
D2	4

Contd…..2

5. A metallurgical company produces four products A, B, C and D by using copper and zinc as basic materials. The material requirements and the profit per unit of each of the four products and the maximum quantities of copper and zinc available are given below:

	Products				Maximum Quantity
	A	B	C	D	Available
Copper (kgs)	4	9	7	10	6000
Zinc	2	1	3	20	4000
Profit per unit (Rs)	15	25	20	60	

a) Find the number of units of the various products to be produced for maximizing the profit.

b) Find the effect of changing the profit per unit of product D to Rs 30.

6. 100 unemployed people were found to arrive at a one person state unemployment office to obtain their unemployment compensation cheque according to the frequency distribution shown below

Inter-arrival time	Frequency	Service time	Frequency
2	10	2	10
3	20	3	20
4	40	4	40
5	20	5	20
6	10	6	10

The state office is interested in predicting the operating characteristics of this one person state employment office during a typical operating day from 10.00 am to 11.00 am. Use simulation to estimate the average waiting time and total time in the system and the maximum queue length. Assume the random numbers for inter-arrival times as 17, 86, 84, 79, 33, 55, 06, 42, 93, 38, 58, 71, 74. For the service times 90, 59, 95, 82, 72, 01, 77, 80, 84, 19, 34.

7. Maximize $Z = 2x_1 + 3x_2$

St $5x_1 + 7x_2 \leq 35$

$4x_1 + 9x_2 \leq 36$ $x_i \geq 0$ and integers.

Use Cutting plane method.

8.a) The stress level at which steel yields (X) has been found to follow normal distribution. For a particular batch of steel, the mean and standard deviation of X are found to be 4000 and 300 kg/cm^2. Find:

i) The probability that a steel bar taken from this batch will have a yield stress between 3000 and 5000 kg/cm^2.

ii) The probability that yield stress will exceed 4500 kg/cm^2.

b) Write short notes on stochastic linear programming.

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