CODE NO: 07A80203

R07

SET No - 1

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
OPTIMIZATION TECHNIQUES
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1 State the optimization problem. Classify and explain various types of optimization problems with examples. [16]

2.a) State the necessary & sufficient conditions for multivariable optimization problem without constraints.

b) Find the maximum or minimum of the function
$f(X) = x_1^2 + x_2^2 + x_3^2 - 4x_1 - 8x_2 - 12x_3 + 56$ [16]

3. A television company has three major departments for manufacture of its two models A and B. Monthly capacities are given as follows:

Departments	Per unit time requirements(hours)		Hours available in this month
	Model A	Model B	
I	4.0	2.0	1600
II	2.5	1.0	1020
III	4.5	1.5	1600

The marginal profit of model A is Rs.400 each and that of model B is Rs.100 each. Assuming that the company can sell any quantity of either product due to favourable market conditions, determine the optimum output for the models, the highest possible profit and the slack time in the three departments? Formulate as LPP model and solve it by simplex method. [16]

4.a) Define transportation problem and represent it mathematically.

b) Find the initial BFS by north-west corner rule and least cost method for the following transportation problem. Compare the transportation cost by each of those methods. [16]

	W	X	Y	Z	Availability
A	19	30	50	10	7
B	70	30	40	60	9
C	40	8	70	20	18
Requirement	5	8	7	14	

5. Min $f(x) = 8x^3 - 2x^2 - 7x + 3$ take to = 0.2. Solve it by Quadratic Interpolation method. Show calculations for two cycles. [16]

6.a) Define the gradient of the function. Explain its importance in optimization.

b) Min f(x) $=x_1^2-x_1x_2+3x_2^2$. Starting point (1,2) by using steepest descent method. Show calculations for two cycles. [16]

7. Using penalty function method, solve the following problem.

Min Z = $(x_2-1)^2+4(x_2-3)^2$

st $x_1^2+x_2^2= 5$ [16]

8. Find the shortest path from A to E in the following network using Dynamic Program:[16]

	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

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SET No - 2

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OPTIMIZATION TECHNIQUES
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. Explain the following with suitable examples:
   a) Design vector b) Objective function c) Constraints. [16]

2 Solve the following non-LPP by Lagrangian multiplier method:
$Min\ Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$
$st\ x_1 + x_2 + x_3 = 15$ and $x_i \geq 0\ \forall i$ [16]
$2x_1 - x_2 + 2x_3 = 20$

3 Solve the following LPP by Big M method:

$Max\ Z = 4x_1 + 5x_2 - 3x_3 + 50$
$st\ x_1 + x_2 + x_3 = 10$
$x_1 - x_2 \geq 1$ [16]
$2x_1 + 3x_2 + x_3 \leq 40 \quad x_i \geq 0 \forall i$

4.a) Define balanced transportation problem.
b) Use Vogel's approximate method to obtain an initial basic feasible solution of the transportation problem & find the optimal solution. [16]

	W	X	Y	Z	Supply
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

5.a) State the characteristics of Fibonacci method.
b) Find $Min\ Z = x^3 - 3x - 5$. Take initial interval as [0, 1.2] and accuracy α = 10%. Solve it by Fibonacci method. [16]

6.a) $Min\ f(x) = x_1^2 - x_1x_2 + 3x_2^2$ Use univariant method by taking starting point as (1, 2). Show calculations only for two cycles.
b) State the limitations of univariant method and how do you overcome them. [16]

7. Min Z= $x_1^2+x_2^2+x_3^2$

st $x_1+2x_2+3x_3=7$
$2x_1+2x_2+x_3=4.5$
Using penalty function method. [16]

8. Find the shortest route from city A to city I along arcs joining various cities lying between A & I. Distances between cities are given as follows: [16]

	B	C	D
A	2	4	3

	E	F	G
B	7	4	6
C	3	2	4
D	4	1	5

	H	I
E	1	4
F	6	3
G	3	3

	J
H	3
I	4

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SET No - 3

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
OPTIMIZATION TECHNIQUES
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. Explain the following with suitable examples:
   a) Design constraints b) Objective function. [16]

2 Solve the following non-LPP by using Kuhn-Tucker conditions
$Max\ Z = x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$
$st \quad x_1 + x_2 \le 2,\ 2x_1 + 3x_2 \le 12,$ and $x_i \ge 0 \forall i$ [16]

3 A company produces two types of hats. Each hat of first type requires twice as much as labour time as second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second type to 150 and 250 hats. Assuming that the profits per hat are Rs.8 for type A and Rs.5 for type B, formulate the problem as linear model in order to determine the number of hats to be produced of each type so as to maximize the profit. Solve it by simplex method. [16]

4.a) List out various methods for finding an initial basic feasible solution for a transportation problem.
b) Find the optimal solution for the following transportation problem. [16]

Warehouse

Factory	W	X	Y	Z	Availability
A	19	30	50	10	7
B	70	30	40	60	9
C	40	8	70	20	18
Requirement	5	8	7	14	

5.a) Using Fibonacci method $Min\ Z = 12x - 3x^4 - 2x^2$. Take the initial interval as [0, 2] and N = 6. Calculate interval of uncertainty after 6 cycles.
b) State the limitations of Fibonacci method. [16]

6. Min $f(x_1,x_2)=4x_1^2+3x_2^2-5x_1x_2-8x_1$ from starting from point (0,0) by using Powell's method. Show calculations only for three cycles. [16]

7.a) State the characteristics of a constrained non-linear programming problem. Classify it.

b) Explain interior penalty function method for a constrained non-linear programming problem. [16]

8. Find the shortest path from vertex A to B along arcs joining various vertices lying between A & B. [16]

	1	2	3
A	7	6	5

	4	5	6
1	3	4	-
2	6	7	7
3	-	10	10

	7	8	9
4	9	8	-
5	7	6	5
6	-	4	3

	B
7	3
8	9
9	8

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OPTIMIZATION TECHNIQUES
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
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1 A company produces two types of hats. Each hat of first type requires twice as much as labour time as second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second type to 150 and 250 hats. Assuming that the profits per hat are Rs.8 for type A and Rs.5 for type B, In the stated problem write:
a) Design Vector b) Objective Function c) Constraints. [16]

2.a) State the necessary and sufficient conditions of non-LPP with single equality constraint.
b) $Min\ Z = 2x_1^2 - 24x_1 + 2x_2^2 - 8x_2 + 2x_3^2 - 12x_3 + 20$
st $x_1 + x_2 + x_3 = 1 \quad x_i \geq 0 \forall i$ [16]

3. Solve the following LPP problem by Big M method:
$Max\ Z = 4x_1 + 3x_2 + 5x_3$
$st \quad x_1 + 3x_2 + 2x_3 \leq 10$
$2x_1 + 2x_2 + x_3 \geq 6$
$x_1 + 2x_2 + 3x_3 = 14, \quad x_i \forall i$ [16]

4. A company has three factories I,II,III and four warehouses 1, 2, 3, 4. The transportation cost (in Rs.) per unit from each factory to each ware house is given in table. The requirements of each warehouse and the capacity of each factory are given below.

Warehouse / Factory	1	2	3	4	Availability
I	25	17	25	14	400
II	15	10	18	24	600
III	16	20	8	13	600
Requirement	300	300	500	500	

Find the minimum cost of transportation schedule. [16]

5. $Min\ Y = 25600x^4 + 16x^2 - 8x + 1$. Use Quadratic interpolation method. Take step size as 0.1. Show calculations for two refitting. [16]

6.a) Explain the importance of gradient methods.

b) Solve the following problem by Powell conjugate direction method. Show calculations only for two cycles. Min $f = \left(x_1^2 + x_2 - 11\right)^2 + \left(x_1 + x_2^2 - 7\right)^2$. Take starting point as [0,4]. [16]

7. Min $f=(x_1^2 + x_2-11)^2+(x_1+x_2^2-7)^2$ subject to $(x_1-5)^2+x_2^2-26 \geq 0$ and $x_1, x_2 \geq 0$. Use Penalty function method. Show calculations for three sequences. Take R=0.1. [16]

8.a) State the Bellman's principle of optimality. Explain its application in multi-stage decision process with suitable example.

b) Explain the terminology involved in dynamic programming. [16]

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