Code No: R05410209 **Set No. 1**

IV B.Tech I Semester Regular Examinations, November 2008
OPTIMIZATION TECHNIQUES
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Determine the maximum and minimum values of the function: [8]
$12x^5$-$45x^4$+$40x^3$+5
   (b) A d.c. generator has internal resistance of R ohms and develops an open circuit voltage of 'V' volts. Find the value of load resistance 'r' for which the power developed by the generator will be maximum. [8]

2. (a) State and explain the necessary and sufficient conditions for existence of relative optima in case of multivariable optimization with constraints. [8]
   (b) Find the dimensions of a rectangular parallelepiped with largest volume whose sides are parallel to the coordinate planes, to be inscribed in the ellipsoid. [8]

3. A TV manufacturing company has 3 major departments for its manufacture of two methods A and B. Monthly capacities are given as follows:

	Per unit time requirement (hour)		Total machine hrs available in a math
	A	B	
Department 1	4	2	1600
Department 2	2.5	1	1200
Department 3	4.5	1.5	1600

The marginal profit of A is Rs 400/-each and that of model B is Rs 100/-. Assuming that the company sells any quantity of either product due to favorable market conditions, determine the optimum output for both models for higher possible profit for a month. Use graphical method. [16]

4. Solve the following LPP by simplex method
Minimize $Z = -6x_1 - 2x_2 - 6x_3$
subject to $2x_1 - 3x_2 + x_3 \leq 14$
$-4x_1 + 4x_2 + 10x_3 \leq 46$
$2x_1 + 2x_2 - 4x_3 \leq 37$
$x_1 \geq 2x_2 \geq 1x_3 \geq 3$ [16]

5. (a) Explain with an example the various methods of finding BFS in transportation problem
   (b) Solve the following transportation problem [6]

			Availability
4	5	7	25
7	7	3	20
7	3	5	40

Requirement	20	25	20

[10]

6. Draw the flow chart for the univariate method, explain about each block in the flow chart. [16]

7. Explain an interior penalty function to solve a constrained nonlinear programming problem. [16]

8. Minimize $Z = u_1^2 + u_2^2 + u_3^2$,
Subject to $u_1 + u_2 + u_3 = 10$ and $u_1, u_2, u_3 \geq 0$ [16]

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Code No: R05410209 **Set No. 2**

IV B.Tech I Semester Regular Examinations, November 2008
OPTIMIZATION TECHNIQUES
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the different types of optimization problems? Explain each with the help of suitable objective function and constraints. [8]
   (b) If f(x) is optimal at x=x*, show that the first maximum varying even derivative f(x) at x=x* must be positive for f(x*) to be minimum. [8]

2. Find the optimum solution of the following constrained multivariable problem: [16]
   Maximise $Z = 9 - x_1 - 6x_2 - 4x_3 + 2x_1^2 + 2x_2^2 + x_3^2 + 2x_1x_2 + 2x_1x_3$
   subject to $x_1 + x_2 + 2x_3 = 3$

3. (a) State and explain the standard form of LPP. [8]
   (b) Explain the significance of slack, surplus and artificial variables of LPP. [8]

4. Use simplex method to solve maximize $Z = 2x_1 + 5x_2$
   Subjected to $x_1 + 2x_2 \leq 8$
   $x_1 \leq 4$
   $0 \leq x_2 \leq 3$ x_1 is unrestricted.
   [16]

5. (a) Explain a method of constructing a basic solution of a transportation problem. [6]
   (b) Solve the following transportation problem.

			Availability
0	2	0	70
1	4	0	30
0	2	4	50
Requirement	70	50	30

   [10]

6. Draw the flow chart for the univariate method, explain about each block in the flow chart. [16]

7. (a) Explain the convex programming problem. [6]
   (b) By using an interior penalty function method solve the following problem.
   Minimize $f(x_1, x_2) = \frac{1}{3}(x_1 + 1)^3 + x_2$
   Subject to $g_1(x_1, x_2) = 1 - x_1 \leq 0$
   $g_2(x_1, x_2) = -x_2 \leq 0$ [10]

8. An electronic device consists of four components each of which must function for the system to function. The system reliability can be improved by installing parallel units in one or more components. The reliability of components, R with one, two, or three parallel units, and the corresponding cost, C are given in the table. The maximum amount available for this device is 100. Determine the number of parallel units in each component by dynamic programming. [16]

No of parallel units	Components							
	1		2		3		4	
	R	C	R	C	R	C	R	C
1	0.7	10	0.5	20	0.7	10	0.6	20
2	0.8	20	0.7	40	0.9	30	0.7	30
3	0.9	30	0.8	50	0.95	40	0.9	40

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Code No: R05410209 **Set No. 3**

IV B.Tech I Semester Regular Examinations, November 2008
OPTIMIZATION TECHNIQUES
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
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1. (a) Explain a single variable optimization technique. [8]
   (b) Find the maxima and minima of
   $f(x) = \frac{x^4}{(x-1)(x-3)^3}$
   [8]

2. Find the optimum solution of the following constrained multivariable problem: [16]
   Maximise $Z = 9 - x_1 - 6x_2 - 4x_3 + 2x_1^2 + 2x_2^2 + x_3^2 + 2x_1x_2 + 2x_1x_3$
   subject to $x_1 + x_2 + 2x_3 = 3$

3. A TV manufacturing company has 3 major departments for its manufacture of two methods A and B. Monthly capacities are given as follows:

	Per unit time requirement (hour)		Total machine hrs available in a math
	A	B	
Department 1	4	2	1600
Department 2	2.5	1	1200
Department 3	4.5	1.5	1600

   The marginal profit of A is Rs 400/-each and that of model B is Rs 100/-. Assuming that the company sells any quantity of either product due to favorable market conditions, determine the optimum output for both models for higher possible profit for a month. Use graphical method. [16]

4. (a) Explain the canonical form with respect to LPP. [6]
   (b) Solve the following system of equations by using PIVOT operations
   $4x_1 + 3x_2 + x_3 = 13$
   $3x_1 + 0x_2 + 7x_3 = 24$
   $x_1 + 2x_2 + 3x_3 = 14$
   [10]

5. (a) When do you get degeneracy in transportation problem . [6]
   (b) Solve the following transportation problem.

			Availability
7	4	0	5
6	8	0	15
3	9	0	9
Requirement 15	6	8	

   [10]

6. (a) Draw the flowchart for the Fletcher and Reeves method and explain about each block. [8]
   (b) What are the advantages of this method over other methods. [8]

7. Minimize $f(X) = x_1^3 + x_2^3 + 2x_3^3 + x_4^3 - 5x_1 - 5x_2 - 21x_3 + 7x_4$

   subject to $g_1(X) = 2x_1^3 + x_2^3 + x_3^3 + x_4^3 + x_1 - x_2 + x_3 - x_4 - 8 \leq 0$

   $g_2(X) = x_1^3 + 2x_2^3 + x_3^3 + 2x_4^3 - x_1 - x_4 - 10 \leq 0$

   $g_4(X) = 2x_1^3 + x_2^3 + x_3^3 + 2x_1 - x_2 + x_3 - x_4 - 5 \leq 0$

   Starting from the point $X_1 = \begin{Bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{Bmatrix}$ Use interior penalty function method of solution. [16]

8. In an investment project, only 8 units of money are available for allocation in unit amounts to three investment programmes. The return function for each programme is given in table. The function $f_i(x)$ represents the return from investing x units of money in ith investment programme (i= 1,2,3.....). What is the optimal investment policy? [16]

X	0	1	2	3	4	5	6	7	8
$f_1(X)$	0	5	15	40	80	90	95	98	100
$f_2(X)$	0	5	15	40	60	70	73	74	75
$f_3(X)$	0	4	26	40	45	50	51	52	53

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Code No: R05410209 **Set No. 4**

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OPTIMIZATION TECHNIQUES
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Determine the maximum and minimum values of the function: [8]
$12x^5$-$45x^4$+$40x^3$+5

   (b) A d.c. generator has internal resistance of R ohms and develops an open circuit voltage of 'V' volts. Find the value of load resistance 'r' for which the power developed by the generator will be maximum. [8]

2. Find the optimum solution of the following constrained multivariable problem: [16]
Maximise $Z = 9 - x_1 - 6x_2 - 4x_3 + 2x_1^2 + 2x_2^2 + x_3^2 + 2x_1x_2 + 2x_1x_3$
subject to $x_1 + x_2 + 2x_3 = 3$

3. (a) State and explain the standard form of LPP. [8]

   (b) Explain the significance of slack, surplus and artificial variables of LPP. [8]

4. (a) Given the following LP model, introduce slack, surplus and artificial variables to form an equivalent problem that can be presented to the simplex method to obtain an optimal solution.
   maximize $Z = 3x_1 + 2x_2 + 8x_3$
   subjected to $4x_1 - 3x_2 + 12x_3 \geq 12$
   $x_1 + 4x_3 \leq 6$
   $x_1 - x_3 = 2$ and $x_1 \geq 0$ [8]

   (b) Solve the model using simplex algorithm. [8]

5. (a) If all the sources are emptied and all the destinations are filled, show that $\sum a_i = \sum b_j$ is a necessary and sufficient condition for the existence of a feasible solution to a transportation problem [8]

   (b) Prove that there are only m+n-1 independent equations in a transportation problem, m and n being the no. of origins and destinations and that any one equation can be dropped as the redundant equation. [8]

6. Starting from (0,0) , carry out at the most five iterations for the following problem using the method of steepest descent : [16]
Minimize $f(x) = (x_1 - {x_2}^2)^2 + (1 - {x_2}^2)$.

7. Explain an exterior penalty function to solve a constrained nonlinear programming problem. [16]

8. Explain the concept of dynamic programming and show how to solve a linear programming problem by dynamic programming approach with an example. [16]

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