Code No: RR410210 **Set No. 1**

IV B.Tech I Semester Regular Examinations, November 2005
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. (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) State and explain the standard form of LPP. [8]
   (b) Explain the significance of slack, surplus and artificial variables of LPP. [8]

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. Describe a method to obtain an initial feasible for a transportation problem by
   (a) Least cost method [6]
   (b) Vogels approximation method [6]
   Compare both the values and comment [4]

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

7. Classify the constrained optimization techniques and briefly explain each technique. [16]

8. Solve the following problem by the dynamic programming:
   Max $Z = y_1^2 + y_2^2 + y_3^2$
   Subject to constraint $y_1.y_2.y_3 \leq 4$ and $y_1, y_2, y_3 \geq 0$ and integers. [16]

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Code No: RR410210 **Set No. 2**

IV B.Tech I Semester Regular Examinations, November 2005
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) Discuss briefly about the following with respect to LPP
      i. Objective function [3]
      ii. Constraints [3]
      iii. Variable [2]

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

4. Solve the following LPP using simplex method

   maximize Z = $x_1 + 2x_2$

   subject to $x_1 + 2x_2 \leq 4$

   $2x_1 + 5x_2 \leq 10$ **[16]**

5. (a) Compare transportation problem with simplex method [6]
   (b) Solve the following transportation problem [10]

				Availability
9	16	15	9	15
2	1	3	5	25
6	4	7	3	20
Requirement	10	15	25	10

6. Define [8+8=16]
   (a) Gradient of a function
   (b) Steepest descent direction using contour representation.

7. Construct the ϕ_k function, according to (a) interior and (b) exterior penalty function methods and plot its contours for the following problem:

   Maximize f = 2x

   Subject to $2 \leq x \leq 10$. [16]

8. Find the minimum value of
   $Z = y_1^2 + y_2^2 + ... + y_n^2$
   Subject to constraint, $y_1.y_2.....y_n = c(c \neq 0)$
   And $y_j \geq 0; j - 1, 2, ..., n.$

[16]

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Code No: RR410210 **Set No. 3**

IV B.Tech I Semester Regular Examinations, November 2005
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) Explain with the help of examples, how optimization problems are classified based on: [8]
   i. Single value objective function
   ii. Multi value objective function.
   (b) Explain the formulation of any engineering problem. Include objective functions and constraints. [8]

2. (a) State and explain Kuhn-Tucker Conditions for non-linear programming problem. [8]
   (b) Use Kuhn-Tucker conditions to determine x_1, x_2, x_3 so as to maximize [8]
   z $= -{x_1}^2 - {x_2}^2 - {x_3}^2 + 4x_1 + 6x_2$
   subject to $x_1 + x_2 <= 2$,
   $2x_1 + 3x_2 <= 12$
   and $x_1, x_2 >= 0$.

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) 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) 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. Draw the flowchart of Powell's method. Explain about each block. [16]

7. Explain the basic approach of the penalty function to solve a constrained nonlinear programming problem. [16]

8. Use dynamic programming technique to solve the following problem. [16]

$$\text{Max}Z = X_1.X_2.X_3.X_4$$

Subject to $X_1 + X_2 + X_3 + X_4 = 12$

$$X_1, X_2, X_3, X_4 \geq 0.$$

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Code No: RR410210 **Set No. 4**

IV B.Tech I Semester Regular Examinations, November 2005
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) Define optimization and discuss its scope. Also explain how different terms are used in the optimization problem. [8]
   (b) Find the maxima and minima, if any of [8]
   f(x) = $4x^3$ $18x^2$ + 27x + - 7

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. Food X contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and cost is 12 paise/gm. Food Y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and cost is 20 paise/gm. The daily minimum requirement of vitamin A and B are 100 and 120 units respectively. Use graphical method to find the cost of product min. [16]

4. Maximize $Z = 8x_2$
   subject to $x_1 - x_2 \geq 0$
   $2x_1 + 3x_2 \leq -6$
   x_1, x_2 are unrestricted in sign use simplex method [16]

5. Describe a method to obtain an initial feasible for a transportation problem by
   (a) Least cost method [6]
   (b) Vogels approximation method [6]
   Compare both the values and comment [4]

6. (a) Discuss about convergence criteria using contour representation. [8]
   (b) Explain about gradient based PARTAN method. [8]

7. (a) Give a proof for the convergence of exterior penalty function method. [8]
   (b) Minimize f(x) = $x_1^3 - 6x_1^2 + 11x_1 + x^3$

   Subject to $x_1^2 + x_2^2 - x_3^2 \leq 0$
   4 - $x_1^2 - x_2^2 - x_3^2 \leq 0$
   x_3 - 5 ≤ 0 and -$x_i \leq 0$, i = 1, 2, 3 [8]

8. Solve the following L.P.P. by dynamic programming approach:
   Max $Z = 4x_1 + 14x_2$,

Subject to $2x_1 + 7x_2 \leq 21$
$7x_1 + 2x_2 \leq 21$
$x_1, x_2 \geq 0.$ [16]

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