Seat NO. ------

GANPAT UNIVERSITY

M. TECH. SEMESTER II ELECTRONICS & COMMUNICATION ENGINEERING
REGULAR EXAMINATION, MAY-JUNE 2012

3EC202 LINEAR AND NONLINEAR OPTIMIZATION

Time: 3 H0URS. **TOTAL Marks: 70**

Instructions:

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks. Assume suitable data, if necessary.

SECTION-I

QUE.1 (A) Explain and write down the objective function, Constraint Surfaces and the statement of an of an optimization problem. **7**

(B) Briefly describe the Engineering application of Optimization. **5**

OR

QUE.1 (A) Write short note on the following optimization techniques **12**

1. Classification based on the nature of the design Variables
2. Ant Colony optimization.
3. Quadratic Programming problem

QUE.2 (A) Analyze the function $f(X) = 12x^5-45x^4+40x^3+5$ and classify the stationary points as maxima, minima and points of inflection. **6**

(B) Explain and give the properties of Convex function and also its testing of convexity for single and two variables.. **5**

OR

QUE.2 (A) Analyze the function $f(X) = -x_1^2-x_2^2-x_3^2+6x_1x_2+2x_1x_3+8x_1-5x_3+2$ and classify the stationary points as maxima, minima and points of inflection. **6**

(B) Minimize $f(X)= x_1^2+x_2^2+60x_1$ **5**
subject to the constraints $g_1= x_1-80\geq 0$
$g_2= x_1+x_2-120\geq 0$
Using Kuhn-Tucker conditions.

QUE.3 (A) Minimize $f(X)= -3x_1^2-6x_1x_2-5x_2^2+7x_1+5x_2$,subject to $x_1+x_2=5$ using the lagrange function. **6**

(B) State and Prove the necessary conditions and sufficient conditions for function of two variables **6**

SECTION-II

QUE.4 (A) Explain the duality of Linear Programming (LP) Problem and explain the relationship between the Primal and dual with the example. **6**

(B) Solve the following LPP using simplex method **6**

Maximize $F = x_1 + 2x_2 + x_3$

subject to

$$2x_1 + x_2 - x_3 \leq 2$$
$$-2x_1 + x_2 - 5x_3 \geq -6$$
$$4x_1 + x_2 + x_3 \leq 6$$
$$x_i \geq 0,\ i = 1, 2, 3$$

OR

QUE.4 (A) Minimize $f(\mathbf{X}) = 2x_1^2+x_2^2-x_3^2 +2x_1x_2+x_1-x_2$ by Newton's method. Starting Point from $x_1 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$. **8**

(B) Define and Explain Revised Simplex method. **4**

QUE.5 (A) Solve the following LPP Using two Phase method **6**

Minimize $f = 2x_1+3x_2+2x_3-x_4+x_5$

subject to

$$3x_1 - 3x_2 + 4x_3 + 2x_4 - x_5 = 0$$
$$x_1 + x_2 + x_3 + 3x_4 + x_5 = 2$$
$$x_i \geq 0,\ i = 1 \text{ to } 5.$$

QUE.5 (B) Explain the Motivation of the simplex method. **5**

OR

QUE.5 (A) Explain the different case of solution of LPP for visual representation. **7**

(B) Explain steepest descent and its working procedure and Convergences Criteria. **4**

QUE.6 (A) Write down the characteristics of standard form of LPP and the Procedure to transform a general form of a LPP to its standard form. **6**

(B) Solve the following LPP Using Graphical method **6**

Minimize $f = 6x+5y$

subject to

$$2x-3y \leq 5$$
$$x+3y \leq 11$$
$$4x+y \leq 15$$
$$x, y \geq 0.$$

END OF PAPER