Student Exam No._____

GANPAT UNIVERSITY

M. Tech. Semester II: Electronics & Communication Engineering

Regular Examination June 2013

3EC202 Linear and Nonlinear Optimization

Time: 3 Hours **Total Marks: 70**

Instruction:

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.
4. Assume suitable data, if necessary.

SECTION-I

Que.-1	**(A)**	Explain five major phases for development of an optimization model.	**5**
	(B)	Define Composite constraint surface.	**2**
	(C)	The horse power generated by a Pelton wheel is proportional to u (v-u) where u is the velocity of the wheel, which is variable and v is the velocity of the jet which is fixed. Show that the efficiency of the Pelton wheel will be maximum at u = v/2.	**5**

OR

Que.-1	**(A)**	List out steps used to formulate and solve optimization problems and state six engineering applications of optimization problem.	**7**
	(B)	Analyze the function $f(x) = 12x^5 - 45x^4 + 40x^3 + 5$ and classify the stationary points as maxima, minima and points of inflection.	**5**
Que.-2	**(A)**	State necessary and sufficient condition and prove sufficient condition for unconstrained optimization.	**6**
	(B)	Minimize $f(X) = x1^2 + x2^2 + 60x1$ subject to the constraints g1=x1-80≥0 g2=x1+x2-120≥0 Using Kuhn-Tucker conditions.	**5**

OR

Que.-2	**(A)**	Discussed the optimization of functions of multiple variables subjected to equality constraints using the method of Constrained variation and the method of Lagrange multipliers.	**6**
	(B)	Analyze the function $f(X) = -x1^2 - x2^2 - x3^2 + 2x1x2 + 2x1x3 + 4x1 - 5x3 + 2$ and classify the stationary points as maxima, minima and points of inflection.	**5**
Que.-3	**(A)**	Write short note on following: 1. Classification based on the nature of equations involved 2. Enlist and explain different classical optimization techniques	**8**
	(B)	State whether each of the following functions is convex, concave or neither. 1. $f(x) = e^{-x},\ x > 0$ 2. $f(x) = \sqrt{x},\ x > 0$	**4**

SECTION-II

Que.-4 (A) Explain the different case of solution of LPP for visual representation. 6

(B) Find all the basic solutions corresponding to the system of equations 6

3X+2Y+Z=10
X-2Y+3Z=6
2X+Y-Z=1.

OR

Que.-4 (A) Explain the duality of linear programming (LP) problem and explain the relationship between the primal and dual with example. 6

(B) Maximize f(X1,X2)=X1+2X2 6
Subject to constraints –X1+2X2≤1
X2≤1
X1,X2≥0,

Using simplex algorithm.

Que.-5 (A) Write a short note on CAUCHY method for optimization. 5

(B) Minimize $f(x1, x2, x3) = 2x1^2 + x2^2 - x3^2 + 2x1x2 + x1 - x2$ by Newton's method. Starting point from $X1=\begin{Bmatrix}0\\0\end{Bmatrix}$. 6

OR

Que.-5 (A) Write a short note on NEWTON'S method for optimization. 5

(B) Solve the following LPP using graphical method 6
Minimize f(x,y)=6x+5y
Subject to 2x-3y ≤ 5
x+3y ≤ 11
4x+y ≤ 15
x, y ≥ 0.

Que.-6 (A) Prove that gradient vector represents the direction of steepest ascent. 6

(B) Define sensitivity analysis and list out five basic types of parameter changes that affect the optimal solution. 3

(C) Which convergence criteria can be used to terminate the iterative process in steepest descent method? 3