M.E.Electrical Engineering, 2018

(1st Year, *1st* Semester).

Optimization Techniques

Time: Three Hours

Full Marks: 100

Use a separate Answer-Script for each Part

PART-I.

Answer *any two* questions from this part.

1.	With the help of a suitable example, explain the solution steps of Genetic Algorithm.	*17*
2.	Explain the terms Reflection, Contraction and Expansion with reference to the Non-linear Simplex algorithm. Hence, explain the solution algorithm of the non-linear Simplex method.	6+11
3.	Explain the terms Branching and Bounding in the context of Branch and Bound method. Explain, with the help of an example, how the method may be applied to solve a job assignment problem.	4+13

Ref. No. : Ex/PG/EE/T/116A/2018

M.E. ELECTRICAL ENGINEERING FIRST YEAR FIRST SEMESTER - 2018

SUBJECT: - OPTMIZATION TECHNIQUES

Time: ~~Two hours~~/Three hours/ ~~Four hours/ Six hours~~

Full Marks 100
(33 marks for this part)

Use a separate Answer-Script for each part

PART II

No. of Questions		Marks

Answer any *two* questions
One marks reserved for neatness

1 a) Write down the necessary and sufficient condition for unconstrained multivariable optimization problem. **4**

b) Find the extreme points of the following function and also determine their nature **6**

$f(x_1,x_2) = 2x_1^3+x_2^2+6x_1^2+12x_2+10$

c) Show that a*n* extreme point of a function $f(x_1,x_2)$ must satisfy the condition $\left(\frac{\partial f}{\partial x_1}-\frac{\partial f/\partial x_2}{\partial g/\partial x_2}.\frac{\partial g}{\partial x_1}\right)=0$ when the constraint $g(x_1,x_2)$ is present. **6**

2. a) Find the extreme point and its nature for the following function using the method of Lagrangian Multiplier **10**

$f(x_1,x_2) = 2x_1+3x_2+15$ subject to the constraint $3x_1+2x_2^2=5$

Explain briefly the physical significance of Lagrangian Multiplier.

b) Show that Newton's Method of Optimization requires only a single step of iteration to find the extreme point of a quadratic function. What are the major drawbacks of this method? **6**

3 (a) Starting from the point (0,0) show two steps of iteration of the Steepest Descent method for finding the minimum point of the following function **8**

$f(x_1,x_2) = x_1^2+2x_2^2+x_1x_2- x_1+x_2$

b) Discuss how Quasi-Newton method overcomes the drawbacks of Newton's method. **8**

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M.E. ELECTRICAL ENGINEERING
FIRST YEAR FIRST SEMESTER EXAM 2018
SUBJECT: - OPTIMIZATION TECHNIQUES

Time: Three hours

Full Marks: 100
(33 marks for this part)

Use a separate Answer-Script for each part

No. of Questions	PART - III Answer any two One mark reserved for well organized answers	Marks
(1)	Asim Co. markets two products: ABC and XYZ. Manufacturing time and monthly capacities are given below;	(16)

	Manufacturing time per unit in Hours		Maximum Hours Available
	ABC	XYZ	
Machining	4.0	2.0	1600
Fitting & Assembly	2.5	1.0	1200
Testing	4.5	1.5	1600

The ABC model costs Rs 250 and sells for Rs 400. The XYZ model costs Rs 375 and sells for Rs 575. Market demand is such that Asim can sell either product. However, management is interested in optimizing its product mix.

a) Set up the appropriate linear program.
b) Solve this problem using the simplex algorithm (do not use the graphical method of solving LP) and interpret the resulting solution.

(2) Fullerton Chemical Corporation must produce exactly 2000 kilos of a special mixture of phosphate and potassium for a customer. Phosphate costs Rs 10 /kg and potassium costs Rs 12 /kg. No more than 600 kilos of phosphate can be used, and at least 300 kilos of potassium must be used. The problem is to determine the least-cost blend of two ingredients. Use the simplex method to solve this problem (do not use the graphical method of solving LP) — (16)

(3) a) What is the motivation for Simplex Method of Solving Linear Programming Problems? — (4)

(please turn over)

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(33 marks for this part)

Time: Three hours

b)	Find the solution of the following LP problem graphically: Minimize $f = 3x_1 + 2x_2$ Subject to $8x_1 + x_2 \geq 8$ $2x_1 + x_2 \geq 6$ $x_1 + 3x_2 \geq 6$ $x_1 + 6x_2 \geq 8$ $x_1 \geq 0,\ x_2 \geq 0$	(12)