

Registration No :

--	--	--	--	--	--	--	--	--	--

Total Number of Pages : 02

B.Tech  
PEL5H001

5<sup>th</sup> Semester Regular / Back Examination 2019-20

OPTIMIZATION IN ENGINEERING

BRANCH : EEE

Max Marks : 100

Time : 3 Hours

Q.CODE : HRB295

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- State degenerate and non-degenerate basic feasible solution.
- Write the Dual of the Primal Min  $Z = 3x_1 + x_2$   
Subjected to constraints  $x_1 - 2x_2 + 4x_3 \geq 4$ ,  $3x_1 - x_2 - x_3 - 2x_4 \geq 6$  where  
 $x_1, x_2, x_3 \geq 0$ ,  $x_4$  is unrestricted.
- Why we use Dual Simplex method?
- Write the value of conjugate golden ratio.
- What do you mean by degeneracy in a transportation problem?
- State the necessary condition for the existence of an extreme point of a multivariable function.
- Write the function  $f(x, y) = xy - x^2 - y^2$ , is convex or concave or neither.
- What are the limitations of sensitivity analysis?
- What is an Integer Programming problem?
- What are the basic characteristics of a queuing system?

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Develop solution of the following linear programming problem graphically  
Maximize  $Z = 5x + 2y$ ,  
Subject to  $2x + 7y \leq 100$ ,  $3x + 8y \leq 135$ ,  
 $x, y \geq 0$ .
- Explain various steps involved in Dual Simplex Method.
- Develop the solution of the following problem by using Simplex method:  
Maximize  $z = 2x + 5y$ ,  
Subject to  $x + 4y \leq 24$ ,  $3x + y \leq 21$ ,  $x + y \leq 9$ ,  
 $x, y \geq 0$ .
- Analyze the solution of the given linear programming problem by Big-M method:  
Maximize  $Z = 3x - y$ ,  
Subject to  $2x + y \leq 2$ ,  $x + 3y \geq 3$ ,  $y \leq 4$ ,  
 $x, y \geq 0$ .
- Solve the given Integer Programming problem by branch and bound algorithm:  
Maximize  $z = 5x + 6y$ ,  
Subject to  $x + y \leq 5$ ,  $4x + 7y \leq 28$ ,  
 $x, y \geq 0$ ,  $x, y$  are integers.
- Explain briefly the various steps involved in Stepping Stone method.
- Calculate the relative maximum and relative minimum of the following function  $f(x, y, z) = x + 2z + yz - x^2 - y^2 - z^2$ .

- h) Discuss various steps involved in Golden Section Search method.  
 i) Evaluate an initial basic feasible solution to the following transportation problem using north-west corner rule

	To					Available
From	3	4	6	8	9	20
	2	10	1	5	8	30
	7	11	20	40	3	15
	2	1	9	14	16	13
Demand	40	6	8	18	6	

- j) Write short notes on Hungarian method for the solution of Assignment problem.  
 k) Solve the given nonlinear programming problem by using Lagrange Multiplier Method:  
 Maximize  $Z = 4x_1 - x_1^2 + 8x_2 - x_2^2$ ,  
 Subject to  $x_1 + x_2 = 2$ ,  
 $x_1, x_2 \geq 0$ .  
 l) Describe the Characteristics of the Queuing system.

**Part-III**

**Only Long Answer Type Questions (Answer Any Two out of Four)**

- Q3** Discuss Revised Simplex method to solve the given problem (16)  
 Minimize  $z = -4x_1 + x_2 + 2x_3$ ,  
 Subject to  $2x_1 - 3x_2 + 2x_3 \leq 12$ ,  $-5x_1 + 2x_2 + 3x_3 \geq 4$ ,  $3x_1 - 2x_3 = -1$ ,  
 $x_1, x_2, x_3 \geq 0$ .
- Q4** Describe the solution of the given nonlinear problem by using Fibonacci method: (16)  
 Minimize  $f(x) = x^2 + 2x$  within  $[-3,4]$ , with 5% exact value.
- Q5** Discuss various steps involved in order to solve the given nonlinear optimization problem by using Kuhn-Tucker method: (16)  
 Minimize  $f(x, y) = x^2 - 4x + y^2 - 6y$ ,  
 Subject to  $x + y \leq 3$ ,  $-2x + y \leq 2$ ,  
 $x, y \geq 0$ .
- Q6** a) Write short notes on Markovian Queuing model. (8)  
 b) In a store with one server, 9 customers arrive on an average of 5 minutes. Service is done for 10 customers in 5 minutes. (8)  
 Find (i) The average number of customers in the system.  
 (ii) The average Queue length.  
 (iii) The average time a customer spends in the store.