Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PEE5H001

5th Semester Regular / Back Examination 2019-20
OPTIMIZATION IN ENGINEERING
BRANCH : ELECTRICAL
Max Marks : 100
Time : 3 Hours
Q.CODE : HRB292

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)**

a) State degenerate and non-degenerate basic feasible solution.
b) 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.
c) Why we use Dual Simplex method?
d) Write the value of conjugate golden ratio.
e) What do you mean by degeneracy in a transportation problem?
f) State the necessary condition for the existence of a extreme point of a multivariable function.
g) Write the function $f(x,y) = xy - x^2 - y^2$, is convex or concave or neither.
h) What are the limitations of sensitivity analysis?
i) What is an Integer Programming problem?
j) What are the basic characteristic of a queuing system?

Part- II

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

a) Develop solution of the following linear programming problem graphically
Maximize $Z = 5x + 2y$,
Subject to $2x + 7y \leq 100, 3x + 8y \leq 135$,
$x, y \geq 0$.
b) Explain various steps involved in Dual Simplex Method.
c) Develop the solution of the following problem by using Simplex method:
Maximize $z = 2x + 5y$,
Subject to $x + 4y \leq 24, 3x + y \leq 21, x + y \leq 9$,
$x, y \geq 0$.
d) Analyze the solution of the given linear programming problem by Big-M method:
Maximize $Z = 3x - y$,
Subject to $2x + y \leq 2$, $x + 3y \geq 3, y \leq 4$,
$x, y \geq 0$.
e) 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.
f) Explain briefly the various steps involved in Stepping Stone method.
g) 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
	3	4	6	8	9	20
From	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.