QPC: RJ19BTECH169 AR - 19 Reg. No. | | | | | | | | | | |

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester – Regular) Examinations, June – 2021

BHSEE4060 / BHSEL4060 / BHSME4060- OPTIMIZATION IN ENGINEERING

(Common to EE, EEE and Mechanical Engg.)

Time: 2 hrs Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) (1 x 10 = 10 Marks)

Q.1. Answer ***ALL*** questions		[CO#]	[PO#]
a.	_____ is a mathematical technique used to solve the problem of allocating limited resource among the competing activities. (i) Linear Programming problem (ii) Assignment Problem (iii) Non linear Programming Problem (iv) Replacement Problem	1	1
b.	A set of feasible solution to a Linear Programming Problem is _____ (i) convex (ii) triangle (iii) bold (iv) polygon	1	1
c.	The coefficient of slack\surplus variables in the objective function are always assumed to be _____. (i)1 (ii) M (iii)0 (iv) -M	1	1
d.	The assignment problem is always a _____matrix. (i) circle (ii) square (iii) triangle (iv) rectangle	2	1
e.	When the total demand is equal to supply then the transportation problem is said to be _____ (i) unbalanced (ii) maximization (iii) balanced (iv) minimization	2	1
f.	The process that performs the services to the customer is known as _____. (i) service channel (ii) queue (iii) server (iv) customers	3	1
g.	A queuing system is said to be a _____ when its operating characteristic are dependent upon time (i) steady state (ii) pure death model (iii) transient state (iv) pure birth model	3	1
h.	The calling population is assumed to be infinite when _____. (i) capacity of the system is infinite (ii) arrivals are independent of each other (iii) all customers arrive at once (iv) service rate is faster than arrival rate	3	1
i.	Which of the following function is convex? (i)$f(x)=10-x^2$ (ii) $f(x)=x^4+6x^2+12x$ (iii) $f(x)=x^4+x^2$ (iv)None of the above	4	1
j.	A local maximum of a concave function on a convex set is also a _____	4	1

of that function.

(i)Global minimum (ii)local maximum

(iii) Global maximum (iv)local minimum

PART – B: (Short Answer Questions) **(2 x 5 = 10 Marks)**

Q.2. Answer ***ALL*** questions	[CO#]	[PO#]
a. What is sensitivity analysis?	1	1
b. Write the difference between the transportation problem and the assignment problem.	2	1
c. State Bellman's principle of optimality	3	1
d. What do the letters in the symbolic representation (a / b / c):(d / e) of a queueing model represent?	3	1
e. State the special cases in Kuhn-Tucker Conditions.	4	1

PART – C: (Long Answer Questions) **(6 x 5 = 30 Marks)**

Answer ***ANY FIVE*** questions	Marks	[CO#]	[PO#]
3. Use simplex method to Max Z = $3x_1 + 2x_2 + 5x_3$ Subject to $x_1 + 4x_2 \le 420,\ 3x_1 + 2x_3 \le 460,\ x_1 + 2x_2 + x_3 \le 430\ \&\ x_1, x_2 \ge 0$	(6)	1	2
4. Use duality to solve the following LPP Min $z = 2x_1 + 2x_2$ Subject to $2x_1 + 4x_2 \ge 1\ ,\ -x_1 - 2x_2 \le -1,\ 2x_1 + x_2 \ge 1 \& x_1, x_2 \ge 0$	(6)	1	2
5. Solve the transportation problem:	(6)	2	2
6. Solve the following mixed integer programming problem Max Z = $x_1 + x_2$ Subject to the constraints $2x_1 + 5x_2 \le 16$ $6x_1 + 5x_2 \le 30\ ,\ x_2 \ge 0,\ x_1$ is non negative integers	(6)	2	2
7. Solve the following LPP using dynamic programming principles Max Z = $2x_1 + 5x_2$ Subject to the constraints	(6)	3	2

		1	**2**	**3**	**4**	**Supply**
Factory	**I**	21	16	25	13	**11**
	II	17	18	14	23	**13**
	III	32	27	18	41	**19**
Demand		**6**	**10**	**12**	**15**	

$2x_1 + x_2 \leq 43$

$2x_2 \leq 46$

$\& \; x_1, x_2 \geq 0$

8. A vessel is to be loaded with stocks of 3 items. Each item 'j' has a weight of w_j and a value of v_j. The maximum cargo weight the vessel can take is 5 and the details of three items are as follows: (6) 3 2

j	w_j	v_j
1	1	30
2	3	80
3	2	65

Develop the recursive equation for the above case and find the most valuable cargo load without exceeding the maximum cargo weight by using dynamic programming.

9. Solve the Non-linear programming problem using the Lagrangian method. (6) 4 2

Optimize, $Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$

Subject to the constraints $x_1 + x_2 + x_3 = 15$

$2x_1 - x_2 + 2x_3 = 20$

$x_1, x_2, x_3 \geq 0$.

10. Solve the NLP by using Kuhn-Tucker Conditions (6) 4 2

Min $Z = -x_1^2 + 2x_2^2 + 3x_3^2$

Subject to the constraints

$x_1 - x_2 - 2x_3 \leq 12$

$x_1 + 2x_2 - 3x_3 \leq 0.8$

$x_1, x_2, x_3 \geq 0$

--- End of Paper ---