QPC: RJ18001171 AR - 18 Reg. No. | | | | | | | | | | |

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, June – 2021

(Sixth Semester)

BMEOE6050 – OPTIMIZATION IN ENGINEERING

(Common to Biotech and Chemical 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.	A feasible solution to a linear programming problem _____. (i) must satisfy all the constraints of the problem simultaneously (ii) need not satisfy all of the constraints, only some of them (iii) must be a corner point of the feasible region. (iv) must optimize the value of the objective function	1	1
b.	If there is no non-negative replacement ratio in solving a Linear Programming Problem then the solution is _____. (i) feasible (ii) bounded (iii) unbounded (iv) infinite	1	1
c.	To proceed with the Modified Distribution method algorithm for solving an transportation problem, the number of dummy allocations need to be added are_____. (i)n (ii) n-1 (iii)2n-1 (iv)n-2	2	1
d.	In marking assignments, which of the following should be preferred? (i) Only row having single zero (ii) Only column having single zero (iii) Only row/column having single zero (iv) Column having more than one zero	2	1
e.	The solution to a transportation problem with m-sources and n-destinations is feasible if the numbers of allocations are _____. (i)m+n (ii)m-n (iii)mn (iv) m+n-1	2	1
f.	The allocation cells in the transportation table will be called _____ cell (i) occupied (ii) unoccupied (iii) no (iv) finite	2	1
g.	A queuing system is said to be a _____ when its operating characteristic are independent upon time. (i) pure death model (ii) steady state (iii) pure birth model (iv) transient state	3	1
h.	The customers of high priority are given service over the low priority customers is _____. (i) Pre emptive (ii) FIFO (iii)SIRO (iv)LIFO	3	1
i.	Dynamic programming' falls under which category?	3	1

(i) Enumerative Technique (ii) Meta-heuristic Technique

(iii) Simulation Technique (iv)None of the above

j. In a Non-linear programming problem 4 1

(i) The objective function must be non-linear (ii) Either the objective function or at least one constraint must be non-linear

(iii) All the constraints must be non-linear (iv) The objective function and all the constraints must be non-linear

PART – B: (Short Answer Questions) (2 x 10 = 20 Marks)

Q.2. Answer ***ALL*** questions [CO#] [PO#]

a. When are slack and surplus variables used in L.P problems? 1 1

b. What are the methods used to find the Initial basic Feasible Solution in Transportation Problem? 2 1

c. State Bellman's principle of optimality 3 1

d. What are the basic characteristics of queuing system? 3 1

e. Write down the necessary condition for general non-linear programming problem by Lagrange's multipliers method for equal constraints. 4 1

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

Answer ***ANY FIVE*** questions Marks [CO#] [PO#]

3. Solve the LPP by simplex method (6) 1 2

Min z = $x_1 - 3x_2 + 2x_3$ subject to

$3x_1 - x_2 + 2x_3 \le 7, -2x_1 + 4x_2 \le 12, -4x_1 + 3x_2 + 8x_3 \le 10, x_1, x_2, x_3 \ge 0$

4. Apply the principle of duality to solve the LPP (6) 1 2

Max $z = 3x_1 + 2x_2$

Subject to

$x_1 + x_2 \ge 1$, $x_1 + x_2 \le 7$, $x_1 + 2x_2 \le 10$ & $x_1, x_2 \ge 0$

5. Solve the transportation problem: (6) 2 2

		1	**2**	**3**	**4**	**Supply**
Factory	**I**	10	12	15	8	**130**
	II	14	11	9	10	**150**
	III	20	5	7	18	**170**
Demand		**90**	**100**	**140**	**120**	

6. Use Branch and Bound method to solve the following (6) 2 2

Max $z = 2x_1 + 2x_2$ Subject to

$5x_1 + 3x_2 \le 8$,

$x_1 + 2x_2 \le 4$&

$x_1, x_2 \ge 0$ and integers

7.	Solve the following LPP using dynamic programming principles Max Z = $4x_1 + 14x_2$ Subject to the constraints $2x_1 + 7x_2 \leq 21, 7x_1 + 2x_2 \leq 21 \& x_1, x_2 \geq 0$	(6)	3	2
8.	Patients arrive at clinic according to poison distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. Examination time per patient is exponential with a mean rate of 20 per hour. (1) Find the effective arrival rate at the clinic. (2) What is the probability that an arriving patient will not wait? (3) What is the expected waiting time until a patient is discharged from the clinic?	(6)	3	2
9.	Solve the NLP by Lagrangean Method $Min\ Z = x_1^2 + x_2^2 + x_3^2$ *Subject to the constraints* $4x_1 + x_2^2 + 2x_3 = 14$ $x_1, x_2, x_3 \geq 0$.	(6)	4	2
10.	Use the KT conditions to solve the NLPP. $\text{Max Z} = 7x_1^2 + 5x_2^2 + 6x_1$ Subject to the constraints $x_1 + 2x_2 \leq 10$ $x_1 - 3x_2 \leq 9$ $x_1, x_2 \geq 0$.	(6)	4	2

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