QP Code: RM21BTECH521 | Reg. No | | | | | | | | | | | AY 21

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Sixth Semester Regular) Examinations, May – 2024

21BBTOE36001 – Optimization Engineering

(Chemical/Biotech)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions		
a.	Write the mathematical formulation of LPP.	CO1	K1
b.	Write Kuhn-Tucker's condition.	CO4	K1
c.	Write the advantages of dual simplex method on simplex method.	CO2	K1
d.	Identify what type of IPP is it. Max $Z = 3X_1+4X_2$ Subject to: $5X_1+4X_2 \leq 200$ $3X_1+5X_2 \leq 150$ Where $X_1, X_2 \geq 0$ and X_2 = Integer.	CO3	K2
e.	Write different type of customer's behavior.	CO3	K2

PART – B **(15 x 4 = 60 Marks)**

		Marks	CO #	Blooms Level
	Answer ***ALL*** questions			
2. a.	Solve the following LPP using simplex method. Max $Z = X_1+2X_2+X_3$ Subject to: $2X_1+X2-X3 \geq -2$ $-2X_1+X_2-5X3 \leq 6$ $4X_1+X_2+X_3 \leq 6$ Where $X_1, X_2, X_3 \geq 0$	10	CO1	3
b.	A company produces two different products A &B and makes a profit of Rs.40 and Rs.30 per unit, respectively. The production process has a capacity of 30,000 man hours. It takes 3hours to produce one unit of A and one hour to produce one unit of B. The market survey indicates that the maximum number of units of product A that can be sold is 8000 and those of B is 12,000. Formulate the problem statement in order to maximize the profit and meet the requirements?	5	CO1	2
	(OR)			
c.	Solve the following LPP using simplex method. Min $Z = 4X_1+X_2$ Subject to: $3X_1+X_2=3$ $4X_1+3X_2 \geq 6$ $X_1+2X_2 \leq 4$ Where $X_1, X_2 \geq 0$	10	CO1	3
d.	Solve the following LPP using graphical method. Max $Z = 3X_1+4X_2$ Subject to: $5X_1+4X_2 \leq 200$ $3X_1+5X_2 \leq 150$ $5X_1+4X_2 \geq 100$ $8X_1+4X_2 \geq 80$ Where $X_1, X_2 \geq 0$	5	CO1	3
3.a.	Solve the following transportation problem to maximize the profit using MODI method.	15	CO3	2

Source / Destination	A	B	C	D	**Supply**
1	15	51	42	33	**23**
2	80	42	26	81	**44**

3	90	40	66	60	**33**
Demand	**23**	**31**	**16**	**30**	

(OR)

b. Solve the following Integer Programming Problem using branch and bound technique. 15 CO2 3

Max $Z = 2X_1+2X_2$

Subject to: $5X_1+3X_2 \leq 8$

$X_1+2X_2 \leq 4$ X_1 and $X_2 \geq 0$ and are integers.

4.a. Solve the following assignment problem assuming job C cannot be assigned to machine 6. 8 CO3 2

		Machine					
		1	2	3	4	5	6
Job	A	11	17	8	16	20	15
	B	9	7	12	6	15	13
	C	13	16	15	12	16	8
	D	21	24	17	28	2	15
	E	14	10	12	11	15	6

b. Find the initial solution of the transportation problem using VAM method. 7 CO3 2

Source / Destination	A	B	C	D	**Supply**
1	4	6	8	13	**50**
2	13	11	10	8	**70**
3	14	4	10	13	**30**
4	9	11	13	8	**50**
Demand	**25**	**35**	**105**	**20**	

(OR)

c. Solve the following LPP using two phase method. 8 CO1 3

Max $Z = 5X_1-2X_2+3X_3$

Subject to: $2X_1+2X_2-X_3 \geq 2$

$X_1-4X_3 \leq 3$

$X_2+3X_3 \leq 5$

Where $X_1, X_2, X_3 \geq 0$

d. Solve the following LPP using dual simplex method. 7 CO2 3

Max $Z = 3X_1+17X_2+9X_3$

Subject to: $X_1-X_2+X_3 \geq 3$

$-3X_1+2X_3 \leq 1$ Where $X_1, X_2, X_3 \geq 0$

5.a. Solve the following NLPP using Fibonacci search method. 10 CO4 3

Max $Z= -3X^3+21.6X+1$.

Value of X lies between 0 and 25 with a minimum resolution of 0.5 for 6 functional evaluation.

b. People arrive at a theatre ticket centre in a Poisson distributed arrival rate of 25 per hour. Service time is at 2 minute. Calculate the expected number in the waiting line, waiting time and utilization factor. 5 CO4 2

(OR)

c. Solve the following problems using Lagrange method. 10 CO4 3

Min $Z = -2X_1^2+5X_1X_2-4X_2^2+18X_2$

Subject to: $X_1+X_2=7$, Where $X_1, X_2 \geq 0$

d. Patients arrive at a clinic at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. Examination time per patient is mean rate of 20 per hour. Find the expected waiting time, waiting line and the idle time of the clinic. 5 CO4 2

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