QP Code: RA23BTECH154 | Reg. No | | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Sixth Semester - Regular) Examinations, April 2026

23BHSHS36001 – Optimization Engineering

(Biotech, Chemical, CSE, Mechanical)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(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.	Define "Slack" and "Surplus" variables.	CO1	K1
b.	Discuss the effect of changing RHS values on the optimal solution?	CO2	K1
c.	Write the steps for solving Least cost method.	CO3	K1
d.	Discuss the formula of traffic intensity in queuing theory.	CO4	K1
e.	What are the necessary conditions for optimality using Lagrange multipliers?	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions

		Marks	CO #	Blooms Level
2. a.	Use graphical method to Solve the LPP. Maximize $Z = 3x_1 + 2x_2$, Subject to $5x_1 + x_2 \geq 10$, $x_1 + x_2 \geq 6$, $x_1 + 4x_2 \geq 12$, $x_1, x_2 \geq 0$	5	CO1	K2
b.	Solve the following LPP by simplex method $\max Z = 3x_1 + 2x_2$ subject to conditions $x_1 + x_2 \leq 4$, $x_1 - x_2 \leq 2$, and $x_1 \geq 0$, $x_2 \geq 0$	5	CO1	K2
	(OR)			
c.	Solve by using big-M method the following linear programming problem: $\max Z = -2x_1 - x_2$ subject to conditions $3x_1 + x_2 = 3$, $4x_1 + 3x_2 \geq 6$, $x_1 + 2x_2 \leq 4$ and $x_1 \geq 0$, $x_2 \geq 0$	10	CO1	K3
3.a.	Solve the LPP, Maximize $Z = 5x_1 + 3x_2$, subject to $3x_1 + 5x_2 \leq 15$ $5x_1 + 2x_2 \leq 10$, $x_1, x_2, \geq 0$			
	a. Find the optimal solution.	10	CO2	K3
	b. Find the range of the coefficient c_1 in the objective function, The current optimal solution will not change.			
	(OR)			
b.	Solve the integer programming problem by using Branch and bound method Maximise $Z = 2x + 3y$ Subject to $6x + 5y \leq 25$ $x + 3y \leq 10$, $x, y \geq 0$	10	CO2	K3
4.a.	There are five jobs to be assigned to five machines are available the cost of each job on each machine is given below. Determine the job assignments that will maximum the total cost			

	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

10 CO3 K3

(OR)

b. Find the optimal solution of the following transportation problem

Warehouse / Factory	W_1	W_2	W_3	W_4	Factory capacity
F_1	19	30	580	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	

10 CO3 K3

5.a. Consider a self-service store with one cashier. Assume Poisson arrivals and exponential service times. Suppose that on average nine customers arrive every 5 minutes and that the cashier can serve 10 in 5 minutes. Find:

i. average number of customers queuing for service

ii. probability of having more than 10 customers in the system, and

iii. probability that a customer has to queue for more than 2

10 CO4 K3

(OR)

b. Explain Dominance properties in game theory and solve the following game using Dominance principle.

2	4	3	8	4
5	6	3	7	8
6	7	9	8	7
4	2	8	4	3

10 CO4 K3

6.a. Solve the non- linear programming problem

$$Min\ Z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$$

Subject to $x_1 + x_2 + x_3 = 20,\ x_1, x_2, x_3 \geq 0$

10 CO5 K3

(OR)

b. Solve the non- linear programming problem by using Kuhn-Tucker Conditions

Maximize $Z = 12x_1 + 21x_2 + 2x_1x_2 - 2x_1^2 - 2x_2^2$

Subject to, $x_2 \leq 8$

$x_1 + x_2 \leq 10, \quad x_1, x_2 \geq 0$

10 CO5 K3

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