QP Code: RA22BTECH436 | Reg. No | | | | | | | | | | | AR21/22

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

B. Tech (Sixth Semester – Regular/Supplementary) Examinations, April 2025

21BBTOE36011/21BCHOE36011/22BBTOE36011/22BCHOE36011 – Optimization Engineering

(Biotech / Chemical)

Time: 3 hrs | Maximum: 70 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Explain the use of slack and surplus variable in LPP	CO1	K1
b. Differentiate between canonical form and standard form of LPP.	CO1	K2
c. Describe the characteristics of basic feasible solution of transportation problem.	CO2	K1
d. Explain the Kendal's notation for queuing problems.	CO3	K1
e. Define local maxima and global maxima of a function	CO4	K1

PART – B **(15 x 4 = 60 Marks)**

Answer ***all*** the questions	Marks	CO #	Blooms Level
2. a. A firm makes products X and Y and has total production capacity of 9 tons per day. X and Y requires same production capacity. The firm has permanent contract to supply at least 2 tons of X and at least 3 tons of Y to another company. Each ton of X requires 20 machine-hour of production time and each ton of Y required 50 machine-hours of production time. Maximum possible machine-hours per day are 360. All the firms output can be sold and profit is made Rs 80/-. Per ton of X and Rs 120/- per ton of Y. Determine the production schedule for maximum profit.	7	CO1	K3
b. Develop solution for the following LPP graphically $Maximize\ Z = 2x + y$ $Subject\ to\ x + 2y \leq 10$ $x + y \leq 6$ $x - y \leq 2$ $x - 2y \leq 1, where\ x, y\ \geq 0$	8	CO1	K4
(OR)			
c. Use simplex method to solve the following problem $Maximize\ Z = 2x_1 + 5x_2$ $x_1 + 2x_2 \leq 24$ $3x_1 + x_2 \leq 21$ $x_1 + x_2 \leq 9,$ $x_1, x_2 \geq 0$	15	CO1	K4
3.a. Use two phase method to solve the following LPP $Maximize\ Z = 5x_1 + 3x_2$ $2x_1 + 1x_2 \leq 1$ $x_1 + 4x_2 \geq 6$ $x_1, x_2 \geq 0$	10	CO1	K4

b. Write the dual of the following primal

$Maximize\ Z = 210 + 115x_2$

$10x_1 + 42x_2 \leq 50$

$31x_1 + 25x_2 \leq 75$

$45x_1 + 71x_2 \leq 80,$

$x_1, x_2 \geq 0$

5 CO1 K3

(OR)

c. Obtain the optimum solution of the given transportation problem.

					Supply
	5	2	4	3	22
	4	8	1	6	15
	4	6	7	5	8
Demand	7	12	17	9	

15 CO2 K4

4.a. Suggest optimal assignment of the workers to jobs, if the completion time (in hour) of different jobs by different workers is arch given below:

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

10 CO2 K4

b. A self -service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes, assuming Poisson's distribution for arrival rate and exponential distribution for the service time. Find

1. Busy period of the cash counter
2. Average number of customers in the system.
3. Average number of customers in the queue
4. Average time a customer spent in the system.
5. Average time a customer waits before being served.

5 CO3 K3

(OR)

c. Use branch and bound algorithm to solve the following IPP

$Maximize\ Z = 2x_1 + 3x_2$

$6x_1 + 5x_2 \leq 25$

$x_1 + 3x_2 \leq 10$

$x_1, x_2 are\ non\ negative\ integers$

15 CO3 K4

5.a. $Minimize\ f(x) = 4x^3 + x^2 - 7x + 14$ within [0,1] using golden section search method with n = 5

12 CO4 K4

b. Explain necessary Kuhn-Tucker conditions for maximize and minimize.

3 CO4 K2

(OR)

c. Solve the following NLPP using the Kuhn-Tucker conditions

$$Maximize\ Z = 2x_1^2 - 7x_2^2 + 12x_1x_2,$$

$$Subject\ to\ 2x_1 + 5x_2 \leq 98$$

$$x_1, x_2 \geq 0$$

15 CO4 K4

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