QP Code: RM22BTECH221 | Reg. No | | | | | | | | | | | AY 22

GIET UNIVERSITY, GUNUPUR – 765022

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

22BHSHS24001– Optimization Engineering

(Mechanical, EE & EEE)

Time: 3 hrs | Maximum: 70 Marks

(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. Define Optimization Engineering with some examples.	CO1	K1
b. Differentiate between Canonical form and standard form of LPP.	CO1	K2
c. Explain the characteristics of basic feasible solution to a transportation problem.	CO2	K1
d. Write the Kendal's notation for Model – I of Queuing theory.	CO3	K1
e. State the special cases in Kuhn-tucker method.	CO4	K1

PART – B **(15 x 4 = 60 Marks)**

Answer ***ALL*** questions	Marks	CO #	Blooms Level
2. a. A company sales two different products, A and B. The company makes a profit of Rs. 40 and Rs. 30 per unit respectively on the two products. The products are produced by a common production process and are sold in two different markets. The production process has a capacity of 30,000 man-hours. It takes 3 hours to produce a unit of product A and 1 hour to produce a unit of product B. The market has been surveyed and company officials found that the maximum units that can be sold for product A and B are 8000 and 12,000 respectively. Formulate the above as a linear programming problem.	7	CO1	K2
b. Solve the following problem using graphical method $Minimize\ Z = 20x_1 + 10x_2$ $Subjected\ to: x_1 + 2x_2 \leq 40$ $3x_1 + x_2 \geq 30,$ $4x_1 + 3x_2 \geq 60$ $x_1, x_2 \geq 0$ (OR)	8	CO1	K3
c. Use simplex method to solve $Maximize\ Z = 2x_1 + 5x_2$ $Subjected\ to\ x_1 + 4x_2 \leq 24$ $3x_1 + x_2 \leq 21$ $x_1 + x_2 \leq 9$ $x_1, x_2 \geq 0$	15	CO1	K4
3.a. Solve the given LPP $Minimize\ Z = 3x_1 + x_2$ $Subjected\ to\ x_1 + x_2 \geq 1$ $2x_1 + 3x_2 \geq 2$ $x_1, x_2 \geq 0$	12	CO1	K4
b. Differentiate between simplex method and dual simple method. (OR)	3	CO1	K2

c. Obtain the optimum solution of the given transportation problem. 15 CO2 K4

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

4.a. Find the optimum assignment cost of the given problem. 10 CO2 K4

		Persons			
		P1	P2	P3	P4
Jobs	J1	15	13	14	17
	J2	11	12	15	13
	J3	13	12	10	11
	J4	15	17	14	16

b. Explain the rules underlying the game theory. 5 CO3 K2

(OR)

c. In a bank, there is only one window. A solitary employee performs all the service required, and the window remains continuously open from 7:00 AM to 1:00 PM. It has discovered that an average number 54 during the day and the average service time is 5 minutes per person, Determine, 8 CO3 K3

(i) Average number of clients in the system
(ii) Average waiting time
(iii) The probability that a client has to spend more than 10 minutes in the system.
(iv) Average queue length.

d. Use branch and bound technique to solve the following integer programming problem. 7 CO3 K4

$$Max.Z = x_1 + x_2$$
$$subject\ to\ 3x_1 + 2x_2 \leq 12,$$
$$x_2 \leq 2$$
$$x_1, x_2 \geq 0\ and\ x_1, x_2\ are\ integers$$

5.a. Find the minimum value of $f(x) = x_1^2 + 2x_1$ within the interval [-3, 4] using Fibonacci search method up to 4 iterations. 15 CO4 K4

(OR)

b. Solve the non-linear programming problem 15 CO4 K4

$$Optimize\ f(x) = 4x_1 - x_1^2 + 8x_2 - x_2^2$$
$$Subjected\ to\ x_1 + x_2 = 2$$
$$and\ x_1, x_2 \geq 0$$

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