QP Code: RM22MBA075 | Reg. No | | | | | | | | | | | AY 22

GIET UNIVERSITY, GUNUPUR – 765022

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

21MBAPC24001 – Operations Research

Time: 3 hrs | Maximum: 60 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. What do you mean by canonical form of LPP?	CO1	L1
b. Define optimal solution.	CO1	L1
c. How can we resolve degeneracy in an LPP?	CO2	L1
d. State the fundamental theorem of duality.	CO2	L2
e. Define optimal solution to a T.P.	CO3	L2
f. How do you convert the maximization assignment problem into a minimization one?	CO3	L1
g. Define a game.	CO4	L1
h. When do you say a game is stable?	CO4	L2
i. Distinguish between PERT and CPM.	CO5	L1
j. What are the three common errors in the construction of network?	CO5	L2

PART – B **(8 x 5 = 40 Marks)**

Answer ***ALL*** questions	Marks	CO #	Blooms Level
2. a. Egg contains 6 units of vitamin A and 7 units of vitamin B per gram and costs 12 paise per gram. Milk contains 8 units of vitamin A and 12 units of vitamin B per gram and costs 20 paise per gram. The daily minimum requirement of vitamin A and vitamin B are 100 units and 120 units respectively. Find the optimal product mix.	8	CO1	L3
(OR)			
b. Solve the following LPP by graphical method. Minimize $Z = 20x_1 + 10x_2$ Subject to $x_1 + 2x_2 \leq 40$ $3x_1 + x_2 \geq 30$ $4x_1 + 3x_2 \geq 60$ $x_1, x_2 \geq 0$	8	CO1	L3
3.a. Solve the following LPP by using simplex method. Max $Z = 2x_1 + x_2$ Subject to, $4x_1 + 3x_2 \leq 12$ $4x_1 + x_2 \leq 8$ $4x_1 - x_2 \leq 8$ $x_1, x_2 \geq 0$	8	CO2	L4
(OR)			
b. Write the dual of the following LPP. Min $Z = 2x_2 + 5x_3$ Subject to, $x_1 + x_2 \geq 2$ $2x_1 + x_2 + 6x_3 \leq 6$ $x_1 - x_2 + x_3 = 4$ $x_1, x_2, x_3 \geq 0$	8	CO2	L4
4.a. A company has three plants A, B and C and three warehouses X, Y and Z. number of units available at the plants is 60, 70 and 80 respectively. Demands at X, Y and Z are 50, 80 and 80 respectively. Unit costs of transportation are as follows:	8	CO3	L3

Company	*Warehouses*		
	X	*Y*	*Z*
A	8	7	3
B	3	8	9
C	11	3	5

What would be your transportation plan? Give minimum distribution cost.

(OR)

b. Four different jobs can be done on four different machines and the take-down time costs are prohibitively high for change overs. The matrix below gives the cost in rupees for producing job *i* on the machine *j*. 8 CO3 L4

Jobs	***Machines***			
	M1	*M2*	*M3*	*M4*
1	5	7	11	6
2	8	5	9	6
3	4	7	10	7
4	10	4	8	3

How should the jobs be assigned to the machines so that the total cost is minimized?

5.a. Two competitors A and B are competing for the same product. Their different strategies given in the following payoff matrix: 8 CO4 L3

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

Use dominance principle to find the optimal strategies.

(OR)

b. A and B each take out one or two matches and guess how many matches opponent has taken. If one of the players guess correctly, then the looser has to pay him as many rupees as the sum of the numbers held by both the players. Otherwise, the payout is zero. Write down the payoff matrix and obtain the optimal strategies of both players. 8 CO4 L4

6.a. A small maintenance project consists of the following jobs, whose precedence relationships are given below: 8 CO5 L3

Job	***1-2***	***1-3***	***2-3***	***2-5***	***3-4***	***3-6***	***4-5***	***4-6***	***5-6***	***6-7***
Time (days)	15	15	3	5	8	12	1	14	3	14

(i) Draw an arrow diagram representing the project.
(ii) Find the floats for each activities.
(iii) Find critical path and the total project duration.

(OR)

b. The time estimates and other characteristics of a project are given below: 8 CO5 L4

Activity (i – j)	***Duration (days)***			***Immediate predecessor***
	Optimistic time	***Most likely time***	***Pessimistic time***	
A	4	5	12	None
B	3	7	11	A
C	8	10	18	A
D	5	7	9	B
E	3	4	11	B
F	7	9	19	C
G	0.5	3.5	9.5	D
H	1	1	1	E,F
I	5	11	17	G,H

(i) Determine the critical path and expected project duration.
(ii) What is the probability that the project can be completed in 40 weeks?
(iii) If the project manager wished to be 90% sure that the project is completed on December 31, 2023, when should he start the project?

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