School of Business
MBA
ETE - Jun 2023

Time : 3 Hours   Marks : 50

Sem II - MSB21T1009 - Operations Research
Your answer should be specific to the question asked
Draw neat labeled diagrams wherever necessary

1. Define two-person zero sum game, payoff matrix, pure strategies and mixed strategies.   K1 CO4 (2)

2. Compare decision-making under certainty, under uncertainty and under risk, and discuss the differences between them.   K2 CO3 (2)

3. The following is the optimal table of Hungarian method. Obtain the optimal solution. Obtain an alternate solution if it exists.   K2 CO2 (2)

	I	II	III	IV
A	0	2	4	7
B	0	0	0	1
C	0	0	0	1
D	2	1	0	0

4. Operations Research is used in day to day life. Explain the statement.   K2 CO1 (2)

5. Examine the fields of application for queuing theory.   K2 CO5 (2)

6. A company produces three products A, B and C. These products require three ores O1, O2 and O3. The maximum quantities of ores O1, O2 and O3 available are 22 tonnes, 14 tonnes, and 14 tonnes respectively. For one tonne of each of these ores, the ore requirements are as follows: K3 CO1 (5)

Product	A	B	C
O1	3	-	3
O2	1	2	3
O3	3	2	3
Profit per tonne (Rs. In thousand)	1	4	5

How many tonnes of products A, B and C should the company produce to maximize profit?

7. Discuss the essential features of queuing system. What are the important random variables in a queuing system to be studied?   K4 CO5 (6)

8. An office has five workers, and five tasks have to be performed. Workers differ in efficiency and tasks differ in their intrinsic difficulty. Time each worker would take to complete each task is given in the effectiveness matrix.   K4 CO2 (5)

Workers Tasks	1	2	3	4	5
A	9	11	14	11	7
B	6	15	13	13	10
C	12	13	6	8	8
D	11	9	10	12	9
E	7	12	14	10	14

How the tasks should be allocated to each worker so as to minimize the total man-hours?

PTO

9. A road transport company has one reservation clerk on duty at a time. He handles information of bus schedules and makes reservations. Customers arrive at a rate of 8 per hour and the clerk can, on average service 12 customers per hour. After stating your assumptions, answer the following: K5 CO5 (8)

    1. What is the average number of customers waiting for the service of the clerk?
    2. What is the average time a customer has to wait before being served?
    3. The management is contemplating to install a computer for handling information and reservations. This is expected to reduce service time from 5 to 3 minutes. The additional cost of the system works out to Rs 50 per day. If the cost of goodwill of having to wait is estimated to be 12 paise per minute spent waiting, before being served, should the company install the computer system? Assume 8 hours working day.

10. Explain the principle of dominance in game theory and solve the following game: K5 CO4 (8)

Player A	Player B				
	B1	B2	B3	B4	B5
A1	2	4	3	8	4
A2	5	6	3	7	8
A3	6	7	9	8	7
A4	4	2	8	4	3

11. You are given the following payoffs of three acts A1, A2, and A3 and the events E1, E2, E3. The probabilities of the states of nature are 0.1, 0.7 and 0.2, respectively. K4 CO3 (8)

States of Nature	Three Acts		
	A1	A2	A3
E1	25	-10	-125
E2	400	440	400
E3	650	740	750

Calculate and tabulate the EMV and conclude which would prove to be the best course of action.