

OCT / NOV - 2022

Total No. of Questions : 5]

SEAT No. :

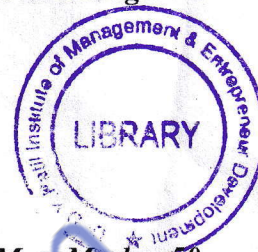
PA-2560

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M.C.A. (Management)

MT - 21 : OPTIMIZATION TECHNIQUES
(2020 Pattern) (Semester - II)



Time : 2½ Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Use of statistical table and non-programmable calculator is allowed.
- 3) Figures to the right indicate full marks.

Q1) Attempt the following multiple choice questions (0.5 marks each) [10]

- a) _____ are expressed in the form of in equities or equations.
 - i) Constraints
 - ii) Objective function
 - iii) Both (i) and (ii)
 - iv) None of the above
- b) Time required by each job and each machine is known as _____ time
 - i) Elapsed
 - ii) Idle
 - iii) Processing
 - iv) Average
- c) Another term commonly used for activity slack time is
 - i) total float
 - ii) free float
 - iii) independent float
 - iv) all of the above
- d) Which of the following criterion is not used for decision-making under uncertainty?
 - i) Maximin
 - ii) Maximax
 - iii) Minimax
 - iv) Minimize expected losses
- e) A two-person-zero-sum-game means that
 - i) the sum of losses to one player is equal to the sum of gains to other.
 - ii) the sum of losses to one player is not equal to the sum of gains to other.
 - iii) no any player gains or losses
 - iv) none of the above
- f) In markov analysis the likelihood that any system will change from one period to the next is revealed by the
 - i) identity matrix
 - ii) transition elasticities
 - iii) matrix of state probabilities
 - iv) matrix of transition probabilities

P.T.O.

- p) The _____ can be referred to as a graphical model of a decision process.
- Expected Opportunity Loss (EOL)
 - Decision Tree
 - Expected Value of Perfect Information (EVPI)
 - Expected Monetary Value (EMV)
- q) The pay-off value for which each player in a game always selects the same strategy is called the
- saddle Point
 - equilibrium point
 - both (i) and (ii)
 - none of these
- r) Cumulative probabilities are found by
- Summing all the probabilities associated with a variable
 - Simulating the initial probability distribution
 - Summing all the previous probabilities upto the current value of the variable
 - Any method one chooses
- s) The maximization or minimization of a quantity is the
- goal of the management science
 - decision for decision analysis
 - Constraint of an LPP
 - Objective of linear programming
- t) A dummy activity is used in the network diagram when
- two parallel activities have the same tail and head events
 - the chain of activities may have a common event yet be independent by themselves
 - both (i) and (ii)
 - none of the above

Q2) a) Solve the following LPP

$$\text{Minimize } Z = 5x_1 + 3x_2$$

Subject to

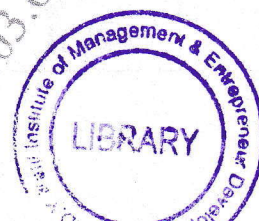
$$2x_1 + 4x_2 \leq 12$$

$$2x_1 + 2x_2 = 10$$

$$5x_1 + 2x_2 \geq 10$$

$$x_1, x_2 \geq 0$$

[6]



- b) Solve the game for the given pay-off matrix [4]

		Player B		
		B_1	B_2	B_3
Player A	A_1	30	40	-80
	A_2	0	50	-20
	A_3	90	20	50

OR

- a) Solve the following LPP [6]

Maximize $Z = 3x_1 + 2x_2$

Subject to

$$x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

- b) Solve the game for given pay-off matrix [4]

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	3	5	4	2
	A_2	5	6	2	4
	A_3	2	1	4	0
	A_4	3	3	5	2

- Q3) a) The following table shows the jobs of a network along with their time estimates [6]

Activity	Immediate Predecessor	Time (days)		
		Optimistic	Most Likely	Pessimistic
A	—	4	6	8
B	A	5	7	15
C	A	4	8	12
D	B	15	20	25
E	B	10	18	26
F	C	8	9	16
G	E	4	8	12
H	D, F	1	2	3
I	G, H	6	7	8



- i) Draw the network diagram.
- ii) Find the expected duration and variance for each activity. What is the expected project length and variance of the project.
- iii) Find the probability that the project is completed in 44 days.
- b) A retailer purchases cherries every morning at Rs. 50/- a case and sells them for Rs. 80/- a case. Any case remaining unsold at the end of the day can be disposed off next day at a salvage value of Rs. 20/- per case. Past sales have ranged from 15 to 18 cases per day. The following is the record of the sales for the past 120 days.

Cases sold	15	16	17	18
No. of days	12	24	48	36

Find how many cases the retailer should purchase per day to maximize the profit. [6]

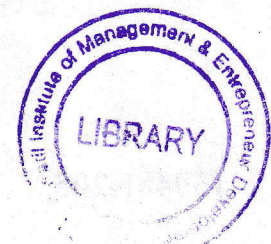
OR

- a) For the data given in the table below, draw the network. Crash the activities systematically to determine the optimal project duration and cost. [6]

Activity	Time (weeks)		Cost is Rs. (000)	
	Normal	Crash	Normal	Crash
1 - 2	2	1	10	15
1 - 3	8	5	15	21
2 - 4	4	3	20	24
3 - 4	1	1	7	7
3 - 5	2	1	8	15
4 - 6	5	3	10	16
5 - 6	6	2	12	36

- i) Draw the network diagram.
- ii) Determine the critical path and the normal duration and associated cost.
- iii) Crash the activities so that the project completion time reduces to 9 weeks with minimum additional cost.
- b) Suresh find the probability of demand distribution of luxury car 's' as follows: [6]

Probability of Demand	0.2	0.4	0.1	0.3
Demand for each car each day	1	2	3	4



The selling price of the car is Rs. 10,00,000/- and it costs to Suresh Rs.6,00,000/- Suresh has always followed a rule for initial purchase, purchase 3 cars.

Find the expected daily profit under the decision rule of buying three cars each morning. If the fees for perfect information is Rs. 1,00,000/- calculate the expected monetary value of the venture with perfect information (EVPI)

- Q4) a) We have 5 jobs each of which must go through the machines A, B and C in the order ABC. The processing times are as follows: [6]

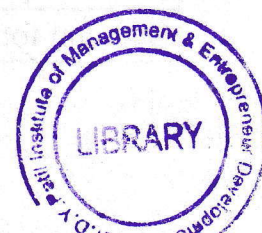
Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

- i) Find the optimal job sequence.
 ii) Find idle time for machine A, B and C
- b) The “School of International studies for population” found out through its survey that the mobility of the population(in percent) of a state to a village, town and city is in the following percentages. [4]

		To		
		Village	Town	City
From	Village	50	30	20
	Town	10	70	20
	City	10	40	50

What will be the proportion of population in village, town and city after 2 years, given that the present population has proportion 0.7, 0.2 and 0.1 in the village, town and city respectively?

OR



- a) A company has to process five items on 3 machines A, B and C. Processing times are given in the following table. [6]

Item	A _i	B _i	C _i
1	4	4	6
2	9	5	9
3	8	3	11
4	6	2	8
5	3	6	7

- i) Find the sequence that minimizes the total elapsed time
 ii) Find the idle times for all the machines.
- b) A market research organization studied the car purchasing trends in a certain region, with a conclusion that a new car is purchased on an average once every 4 years. The buying pattern of the customers is as follows: Of the current small car owners 80% will replace the car again with a small car and 20% with a large car. Similarly 60% of the large car owners will replace it with a small car, while 40% with another large car. Assuming that the market and preferences remain the same, [4]
- i) Construct the transition matrix.
 ii) If there are currently 40,000 small cars and 20,000 large cars in the region, what will be the distribution in 8 years from now

- Q5) a) Over 100 days period, the daily demand of a certain commodity shows the following frequency distribution pattern. [4]

Daily Demand	0	1	2	3	4	5
No. of days	10	20	40	20	6	4

Simulate the demand for 10 days using the random numbers 67, 84, 01, 77, 90, 14, 15, 74, 44, 77
 Also find the average demand.

- b) Explain the following terms [4]
- i) Unbounded solution
 ii) Pessimistic Time

OR



- a) A bakery keeps stock of a popular brand of cake. Previous experience shows the daily demand pattern for the item with associated probabilities as given below:

Daily Demand	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Use the following random numbers to simulate the demand for next 10 days.

25, 39, 65, 76, 12, 05, 73, 89, 19, 49

Also estimate the daily average demand for the cakes on the basis of the simulated data. [4]

- b) Explain the following terms. [4]

- i) In feasible solution
- ii) Float of an activity

