OCT / NOV-2022

Total No. of Questions : 5] **SEAT No. :** PA-2560 [Total No. of Pages : 8 [5948]-205 nagemeny M.C.A. (Management) **MT-21: OPTIMIZATION TECHNIQUES** LIBRARY (2920 Pattern) (Semester - II) [Max. Marks : 50 Time : 21/2 Hours] Instructions to the candidates: 1) All questions are compulsory. Use of statistical table and non-programmable calculator is allowed. 2) Figures to the right indicate full marks. 3) [10] 01) Attempt the following multiple choice questions (0.5 marks each) are expressed in the form of in equities or equations. a) Constraints **i**) ii) Objective function iii) Both (i) and (ii) None of the above iv) Time required by each job and each machine is known as time b) ii) Idle Elapsed i) Average iii) Processing iv) Another term commonly used for activity slack time is c) free float total float ii) i) independent float iv) all of the above iii) Which of the following criterion is not used for decision-making under d) uncertainty? Maximin ii) Maximax i) iv) Minimize expected losses Minimax iii) A two-person-zero-sum-game means that the sum of losses to one player is equal to the sum of gains to other. i) ii) the sum of lossses to one player is not equal to the sum of gains to other. no any player gains or losses iii) none of the above iv) In markov analysis the likelihood that any system will change from one f) peroid to the next is revealed by the identity matrix i) transition elasticities ii) matrix of state probabilities iii) iv) matrix of transition probabilities P.T.O.

The variable whose coefficient vectors are unit vectors are called as **g**) Unit variables i) **Basic** variables 11) iii) Non-basic variables Viv) None of the above Time between starting of the first job and completion of last job in h) sequencing problem is known as i) total time ii) elapsed time iii) assigned time) iv) idle time If an activity has zero slack, it implies that i) it lies on the critical path it is a dummy activity i) ii) the project is progressing well iv) iii) none of the above Decision theory is concerned with i) Methods of arriving at an optimal decision i) ii) Selecting optimal decision in a sequential manner iii) Analysis of information that is available All of the above iv) The size of the pay- off matrix of a game can be reduced by using the **k**) principle of i) game inversion rotation reduction diominance **iii**) iv) game transpose In assigning random numbers in a Monte Carlo simulation it is important 1) to Develop cummulative probability distribution i) Use random numbers from a random number table ii) Use only a single set of random numbers iii) Use excel spreadsheets iv) The first step in formulating the LP problem is m) Graph the problem i) Understand the managerial problem being faced ii) iii) Identify the objective and the constraints Define the decision variables iv) If the problem is a 3- machine problem, we have to convert it into machine problem. 1 i) ii) none of the above iii) m iv) The activity that can be delayed without affecting the execution of 0) immediate succeeding activity is determined by free float total float i) ii) iii) independent float none of the above nemen

[5948]-205

2

IBRAR

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

[6]

- both (i) and (ii) iii)
- iv) none of the above

Solve the following LPP Minimize  $Z = 5x_1 + 3x_2$ 

Subject to

$$2x_{1} + 4x_{2} \le 12$$
  

$$2x_{1} + 2x_{2} = 10$$
  

$$5x_{1} + 2x_{2} \ge 10$$
  

$$x_{1}, x_{2} \ge 0$$

[5948]-205

3

(AShitute

LIBRARY

b) Solve the game for the given pay-off matrix



[4]

nagemen

LIBRAR

Institute

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

Activity	Immediate	Time (days)					
	Predecessor	Optimistic	Most Likely	Pessimistic			
A	-	4	6	8 2			
В	A	5	7	15			
С	A	4	8,00				
D	В	15	20	25			
E	В	10	18 0	26			
F	C	8	C79 ~	16			
G	E	4	8	12			
Н	D, F	1	E S	3			
I	G, H	6	S <sup>7</sup> 7	8			

[5948]-205

4

- 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]

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	3	S 15	21					
2 - 4	4	30	20	24					
3 - 4		Vin	7	7					
3 - 5	2	્યુ	8	15					
4 - 6	5	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	200	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)

We have 5 jobs each of which must go through the machines A, B and C **04)** a) in the order ABC. The processing times are as follows: [6]

III une otuer A	TOU.	i ne j	proce	65111 <u>8</u>	s unic	times are as follows		
Job ?	1	2	3	4	5	<u>(</u> )		
Machine A	8	10	6	7	11	0,0		
Machine B	5	6	2	3	4	<b>?</b>		
Machine C	4	9	8	6	S	3.		

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

	0,	To	
<b>~</b>	Village	Town	City
Vill	age [50	30	20]
From Toy	wn 10	70	20
Ci	ty [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?

IBRAR'

OR



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



- i) Find the sequence that minimizes the total clapsed time
- Find the idle times for all the machines. ii)
- A market research organization studied the car purchasing trends in a b) 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]
  - Construct the transition matrix. i)
  - If there are currently 40,000 small cars and 20,000 large cars in the ii) region, what will be the distribution in 8 years from now
- Over 100 days period, the daily demand of a certain commodity shows Q5) a) the following frequency distribution pattern.

the following fi	eque	ency d	istribu	ition p	atter	rn.			<b>[4</b> ]
Daily Demand	0 "	Sî -	2	3	4	5			×
No. of days	10	20	40	20	6	4	5	a'.	
Simulate the de	man	d for	10 day	's usir	ig th	e rai	dom numbe	ers	
67, 84, 01, 77,	90, 1	4, 15,	74, 44	4, 77			S.S.	SV-	
Also find the av	/erag	ge dem	nand.			A	$\mathcal{D}, \mathcal{D}_{h}$		
Explain the foll	owin	ig term	าร						[4]
i) Unbounde	ed so	lution				S.	2		
ii) Pessimisti	c Tir	ne			$\bigcirc$	Y N	~		
						2.	anagement a	En	
			OI	ર	~	è,	0	Servie 1	
				,	0,		UBRAR	Y	
05			7				1:1	NOT ST	

- b)

\* 101

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 Damand	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, 42, 05, 73, 89, 19, 49

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

23.00.

Inskiule

[4]

agement (

BRAR

10

- b) Explain the following terms.
  - i) In feasible solution
  - ii) Float of an activity

JOUE

[5948]-205