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Total No. of Questions: [09]

Business Administration (BBA-MBA Integrated) (Semester – 4th)
OPERATION RESEARCH
Subject Code: BMBAS1405
Paper ID: 20390123

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) What are the causes of uncertainty in decision making process?
b) What are the applications of operation research in defence sector?
c) What assumptions we make in Transportation model.
d) Explain additive assumption of Linear Programming Method.
e) What are the assumptions in sequencing problems.
f) What are the different type of queuing models
g) Explain maximin-minimax principle.
h) In which year a machine should be replaced.
i) Define assignment model.
j) What are the components of decision tree?

Section – B **(5 marks each)**

Q2. Discuss need and scope of operation research in managerial decision making.

Q3. There are 7 jobs, each of which has to go through the machines A & B in the order A-B. Processing times (in hours) are given as

Job	:	1	2	3	4	5	6	7
Machine A	:	3	12	15	06	10	11	09
Machine B	:	08	10	10	06	12	01	03

Determine a sequence of these jobs that will minimize the total elapsed time (T). Also find T and Idle Time for machines A & B.

Q4. A self service store employees 1 cashier at its counter. Nine customers arrive on an average every five minutes while the cashier can serve 10 customers in 5 minutes. Assuming poisson distribution for arrival rate and exponential distribution for service time. Find

(a) Average number of customers in the system
(b) Average number of customers in the queue.
(c) Average time the customer spends on the system.

(d) Average time a customer waits before being serve.

Q5. Reduce the following two person zero sum game to 2x2 in order to obtain strategies for both players and the value of the game:

		Player B			
		A	B	C	D
	1	3	2	4	0
	2	3	4	2	4
Player	3	4	2	4	0
A	4	0	4	0	8

Q6. Find the cost per period of individual replacement policy of an installation of 300 light bulbs, given the following:

(i) cost of replacing an individual bulb is Rs. 2

(ii) Conditional probability of failure is given below:

Week No.	0	1	2	3	4
Conditional Probability Of failure:	0	0.1	0.3	0.7	1.0

Also calculate the number of light bulbs that would fail during each of the four weeks.

Section – C **(10 marks each)**

Q7. A Transportation Company engaged in carrying parcels has three branches to serve five customers. The distance (in kms.) from each branch to each customer is given below:

		Customer					
		A	B	C	D	E	Trucks available
Branches	1	10	8	12	9	3	15
	2	4	4	6	6	7	12
	3	15	7	11	13	8	16
	Trucks reqd.	8	8	4	6	7	

If an arrival of VVIP blocks the traffic from branch 1 to customer C & D and from branch 2 to customer D & E, what should be the optimal allocation in order to minimize the total transportation cost.

Q8. A manufacturer has five lathes and three milling machines in his workshop and produces an Assembly that consists of 2 units of part A and 3 units of part B. The processing time for each part on the two types of machines is given below.

Part	Processing time in minutes on a	
	Lathe	Milling Machine
A	10	18

B	25	12

In order to maintain a uniform work-load on the two types of machines, the manufacturer has framed a policy that no type of machine should run more than 40 minutes per day longer than the other machine. Formulate the problem as L.P. problem if the objective is to produce the maximum number of assemblies in any 8-hour working day.

Q9. A company has four sales representatives who are to be assigned to four different sales territories. The monthly sales increase estimated for each sales representative for different sales territories (in lakhs of rupees) are shown in following table:

		Sales Territory			
		A	**B**	**C**	**D**
	1	200	150	170	220
	2	160	120	150	140
Sales	**3**	190	195	190	200
Rep	**4**	180	175	160	190

Suggest optimal assignment and the total maximum sales increase per month. If for certain reasons, sales rep. 2 cannot be assigned territory C, then the solution will be same or different?