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Total No. of Questions: 15

Total No. of Pages: 03

MBA (Sem. 3)
Applied Operations Research
Subject Code: MBA-301
Paper ID: C1169

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATES:

1. Attempt any **FOUR** questions from Section A. Each question carries **FIVE** marks.
2. There are **THREE** Sub-Sections in Section B. Attempt **ONE** question from **EACH** Sub-Section. Each question carries **EIGHT** marks.
3. Analyse the facts **ONE** data given in the case in Section C and answer all the questions that follow.

SECTION A

1. Discuss decision making under certainty and uncertainty.
2. Explain simulation and its utility in modern management.
3. What is sensitivity analysis? Explain its significance in linear programming.
4. Solve the following game to find the value and the probabilities of the strategies.

-5	0
8	-1

5. Discuss the applications of queuing theory in business management.
6. Explain the replacement of items that deteriorate with time.

SECTION B
SUB SECTION B.1

7. Discuss the applications of operations research in managerial decision making.
8. Data for a project is given below:

Job	Normal Duration (Day)	Minimum Duration (Day)	Cost of Crashing per day (Rs)
1-2	9	6	20
1-3	8	5	25
1-4	15	10	30
2-4	5	3	10
3-4	11	6	15
4-5	2	1	40

If the overhead cost is Rs 60 per day, find the optimum length of the schedule.

SUB SECTION B. 2

9. Solve the following LPP using simplex method.

$$\begin{aligned} \text{Maximise } & Z = 6x_1 + 4x_2 \\ \text{Subject to } & 2x_1 + 3x_2 \leq 30 \\ & 3x_1 + 2x_2 \leq 24 \\ & x_1 + x_2 \geq 3 \\ \text{where } & x_1 + x_2 \geq 0 \end{aligned}$$

10. Solve the following Transportation problem

Terminals	Plants					
	A	B	C	D	Total	
	U	20	36	10	28	10
	V	40	20	45	20	4
	W	75	35	45	50	6
	X	30	35	40	25	5
	TOTAL	13	10	6	6	

SUB SECTION B.3

11. Solve the following game.

		Player A				
		A ₁	A ₂	A ₃	A ₄	A ₅
Player B	B ₁	1	5	-7	-4	2
	B ₂	2	4	9	-3	1

12. Solve the following sequencing problem.

Job 1	Sequence	A	B	C	D	E
	Time	1	2	3	5	1
Job 2	Sequence	C	A	D	E	B
	Time	3	4	2	1	5

SUB SECTION B.4

13. Following mortality rates have been observed for certain type of fuses:

Week	1	2	3	4	5
% failing by end of week	5	25	40	55	100

There are 1000 fuses in use and it costs Rs 7 to replace an individual fuse. If all fuses were replaced simultaneously, it would cost Rs 1.5 per fuse. At what intervals should the group replacement be done? Which policy is better?

14. Discuss the applications of Poisson distribution in estimating arrival and service rates.

SECTION C

15. COMPULSORY CASE STUDY

As the project manager of ABC Construction Company, you are involved in drawing PERT network for laying the foundation of a new amphitheatre. The relevant information for all the activities of this project is given below:

Activity	Time estimates			Normal Cost for expected duration (Rs)	Crash Cost (Rs)	Immediate predecessors
	t_0	t_m	t_p			
A	2	3	4	6,000	8,000	-
B	4	5	6	12,000	13,500	A
C	3	5	7	16,000	22,000	A
D	2	4	6	8,000	10,000	A
E	1	2	3	6,000	7,500	C,D
F	1	3	5	14,000	20,000	B,E

Questions:

- Construct the PERT network for the project and determine the critical path and the expected duration of the project.
- The Director of your company is not impressed by your PERT analysis. He draws your attention that the project must be completed by 7 weeks and refers to the penalty clause in the agreement which provides for payment of penalty at the rate of Rs 2,500 for every week or part thereof exceeding 7 weeks. Your Director also strongly believes that the time duration of various activities of the project can be crashed to their optimistic time estimates with the crashing costs mentioned in the above table. Determine the optimal duration of the project if your objective is to minimize the sum of the project execution cost and the penalty cost.