PCB3C01 - Applied Operations Research

P. Pages : 2 |*1045*| **GUG/S/24/10690**

Time : Three Hours   Max. Marks : 70

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Notes : 1.   Attempt **any five** questions.
2.   All questions carry equal marks.
3.   Use NSD Table.

1.   Solve the following Game by Matrix Method. Obtain optimal strategy & value of the game

Player B

		B_1	B_2	B_3
	A_1	7	1	7
Player A	A_2	9	-1	1
	A_3	5	7	6

2.   Draw the Network and determine the critical path. What is the probability of completing the project, if scheduled completion time of project is 46 days.

Activity	to-tm-tp
1-2	4-8-12
2-3	1-4-7
2-4	8-12-6
3-5	3-5-7
4-5	0-0-0
4-6	3-6-9
5-7	3-6-9
5-8	4-6-8
6-10	4-6-8
7-9	4-8-12
8-9	2-5-8
9-10	4-10-16

3.   Draw the Network and identify the critical path. Crash the network fully to find out minimum duration. If Indirect cost are ₹300 per day. Determine time cost. Trade off for the project.

Activity	Normal Time (days)	Normal Cost (₹)	Crash Time (days)	Crash Cost (₹)
1-2	5	3,000	4	4,000
2-3	6	1,200	2	2,000
2-5	4	1000	3	1,800
2-4	5	1200	3	2,000
5-6	3	1600	3	1,600

4.   Fleet cars have their costs increasing as they continue in service due to increased direct operating cost and increased maintenance cost. The initial cost ₹3,800. Given the cost of operating, maintenance & the trade in value, determine the proper length of service before car should be replaced.

Year of service	1	2	3	4	5
Year end Trade in value (₹)	2,000	1,200	800	700	600
Annual operating cost (₹)	1,600	1,900	2,200	2,500	2,800
Annual Maintenance cost (₹)	400	500	700	900	1100

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

Week	1	2	3	4	5
% foiling by the end	5	15	35	75	100

There are 1,000 fuses in use and it cost (₹) 5 to replace an individual fuse. If all fuses were replaced simultaneously, if would cost (₹) 1.25 per fuse. At what intervals, the group replacement should be made? Which policy should be adopted & why?

6.   A Refrigeration company has six plants located in different parts of a city. Every year, it is necessary for each plant to be completely overhauled. The overhauling is carried out in two stages A and B. The plant has to be closed for the entire period of its over housing. The present schedule of the overhaul of the six plant is as follows:

Plant	P_1	P_2	P_3	P_4	P_5	P_6
			(days 5)			
Crew A	10	10	8	10	9	12
Crew B	8	6	14	9	7	10

i)   Determine the optimal sequence.
ii) If downtime of any of the six plant cost ₹ 4,000 per day for a plant, Idle time for Crew A cost ₹ 1250 per day & Idle time for crew B cost ₹ 2150 per day. Which of the two schedule will be more economical? What are their respective costs?

7.   The management of ABC company is considering the question of marketing a new product. The fixed cost required in the project is ₹ 4000. The product has a life of only one year. The management has the data on these three factors as under:

Selling Price (₹)	Probability	Variable cost (₹)	Probability
3	0.20	1	0.30
4	0.50	2	0.60
5	0.30	3	0.10

Sales volume (Units)	2000	3000	5000
Probability	0.30	0.30	0.40

Consider the following sequence of thirty random numbers:
81 32 60 : 04 46 31 : 67 25 24 : 10 40 02
39 68 08 : 59 66 90 : 12 64 79 : 31 86 68
82 89 25 : 11 98 16
Using the sequence first 3 random numbers for the first trial. Simulate the Average profit for the above project on the basis of 10 trials.

8.   What is the need of simulation? How can you use Monte Carlo Simulation for industrial problems? Give examples.

9.   What is dynamic programming and what sort of problems can be solved by it? State Bellman's principle of optimality and explain why it holds.

10.   Write short note on **any two.**
   a)   Probabilistic dynamic programming.
   b)   Crashing of Project Network.
   c)   Applications of game theory.
   d)   Assumptions for Johnson's rule.

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