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5362

Your Roll No.

B.A. Programme / III

B

OPERATIONAL RESEARCH

-(T)

Paper III – Operational. Research–II

(Admissions of 2004 and onwards)

Time : 3 Hours

Maximum Marks : 75

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Answer any six questions.

All questions carry equal marks.

1. What is dynamic Programming Problem ? Explain the following in the context of dynamic programming
 - (a) Principle of optimality
 - (b) State
 - (c) Stage
2. A 4-ton Vessel is loaded with one or more of three items. The following table gives the unit weight, W_i , in tons and unit revenue in thousands of dollars, γ_i , for item i . How should the vessel be loaded to maximize the total returns ?

P.T.O.

Item i	W_i	γ_i
1	2	31
2	3	47
3	1	14

3. Discuss the need of integer programming in Mathematical Programming. Also explain the branch and bound method in integer programming.

4. Find the optimum integer solution to the following LPP.

$$\text{Max. } Z = x_1 + 4x_2$$

$$\text{S.t. } 2x_1 + 4x_2 \leq 7$$

$$5x_1 + 3x_2 \leq 15$$

$$x_1, x_2 \geq 0 \text{ and are integers.}$$

5. (a) Define reliability function and failure rate function.

The lives of a certain automobile seal have the

Weibull distribution with failure rate $Z(t) = \frac{1}{\sqrt{t}}$.

Find the Probability that such a seal is still in use after 4 years.

- (b) Compare Series-Parallel and parallel-series system.

6. Explain how the theory of replacement is used in replacement of items whose maintenance cost varies with time.

The cost of a machine is Rs. 6,100 and its scrap value is Rs. 100. The maintenance costs found from experience are as follows :

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	100	250	400	600	900	1200	1600	2000

when should the machine be replaced ?

7. Consider a project consisting of nine jobs (A, B, ---, I) with the following precedence relation and times estimates.

Job	Predecessors	Optimistic time (a)	Most probable time (m)	Pessimistic time (b)
A	—	2	5	8
B	A	6	9	12
C	A	6	7	8
D	B, C	1	4	7
E	A	8	8	8
F	D, E	5	14	17
G	C	3	12	21
H	F, G	3	6	9
I	H	5	8	11

- (a) Draw the project network for the above problem.
- (b) Determine the expected duration, and variance for each job.

- (c) What is the expected length of project and its variable?
- (d) Compute the probabilities of completing the project 5 days earlier than expected.
8. In a factory, there are six jobs to perform, each of which should go through two machines A and B, in the order AB. The processing timing (in hrs) for the jobs are given. Determine the sequence for performing the jobs that would minimize the total elapsed time.

Job	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆
Machine A	1	3	8	5	6	3
Machine B	5	6	3	2	2	10

9. Write short notes on :
- (i) Preventive maintenance
 - (ii) Corrective maintenance
 - (iii) Earliest starting time
 - (iv) Latest starting time
10. (a) Distinguish between job-shop and flow-shop problems. Give an algorithm to solve 2 job and m-machines job-shop problem.
- (b) Compare & contrast PERT & CPM. Justify your answer with reasons.