B.A. Programme/III   A

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. The data for a PERT chart is given in the following table :—

Activity	Three time Estimates (in Days)		
1 – 2	2	4	6
1 – 3	6	6	6
1 – 4	6	12	24
2 – 3	2	5	8
2 – 5	11	14	23
3 – 4	15	24	45
3 – 6	3	6	9
4 – 6	9	15	27
5 – 6	4	10	16

(a) Draw the network.

(b) Calculate the expected length of project and its variance.

(c) What is the probability that the project duration will exceed 60 days ?

2. The following table gives the details of activities and other data for a project :

Activity	Normal		Crash	
	Time	Cost	Time	Cost
1 – 2	4	600	3	800
1 – 3	2	400	2	400
1 – 4	5	750	4	900
2 – 3	7	400	5	600
2 – 5	7	800	6	1000
3 – 5	2	500	1	650
4 – 5	5	600	4	850

Here durations are in days and it is given that indirect cost per day for the project is Rs. 200/-.

(a) Draw the Network of the project.

(b) Find Normal project completion time and cost.

(c) Find optimal project completion time and the minimum cost.

3. Describe Dynamic Programming Approach for solving multi stage decision problems.

4. State Bellman's Principle of optimality and use it to solve

   Max $Z = y_1^2 + y_2^2 + y_3^2$

   subject to $y_1 \cdot y_2 \cdot y_3 = 6$

   y_1, y_2 and y_3 are positive integers.

5. (a) Define Reliability Function, Hazard Rate function and MTBF.

   (b) Derive failure rate and MTBF for the system with failure time following

   (i) Weibull distribution

   (ii) Gamma distribution

6. Describe the replacement policy for the equipment which deteriorates gradually with time and the value of money does not change with time.

7. What is an Integer Programming Problem ? Describe various methods for solving an Integer Programming Problem.

8. Solve the following all-Integer Programming problem by Gomory's cutting plane Algorithm.

   Max $Z = x_1 + 4x_2$

   s.t.

   $2x_1 + 4x_2 \le 7$

4

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

$x_1, x_2 \geq 0$ and are integers.

9. (a) Define Flow shop and job shop sequencing problems.

(b) Solve the following seven job/two machine sequencing problem where the technological ordering of each job is same. Determine the optimal sequence of jobs so that total elapsed time is minimized.

Job	A	B	C	D	E	F	G
Machine 1	7	11	9	9	10	12	10
Machine 2	10	10	7	14	6	10	15

Here the numbers in the above table are the processing times of the jobs on the machines in hours. Also find the idle times of the machines.

10. (a) Differentiate between PERT and CPM.

(b) Explain Solution of n-jobs/m-machines flow shop problem by Johnson's optimality rule.