Exam. Code : 108506
Subject Code : 100837

B.Com. 6th Semester (Batch 2021-24)
OPERATIONS RESEARCH
Paper : BCG-603

Time Allowed—3 Hours] [Maximum Marks—50

Note :—Attempt **FIVE** questions in all, selecting at least **ONE** question from each section. The fifth question may be attempted from any section. All questions carry equal marks.

SECTION—A

1. Explain Operational Research. Discuss its characteristics and limitations.

2. Rewrite the following LPP in standardised form for application of simplex method :

Maximize $Z = 8x_1 - 6x_2 + 7x_3 + 2x_4$

subject to

$$4x_1 + 3x_2 + 6x_3 + x_4 \leq 40$$
$$-x_1 + 2x_2 + 3x_3 + x_4 \leq 5$$
$$9x_1 - 5x_2 + 7x_3 - x_4 \geq 60$$
$$6x_2 + 2x_3 + 4x_4 = 47$$
$$x_1, x_2, x_3, x_4 \geq 0$$

SECTION—B

3. Solve the following transportation problem for minimum cost :

Destination	Origins				Requirement
	A	B	C	D	
1	7	4	3	4	15
2	3	2	7	5	25
3	4	4	3	7	20
4	9	7	5	3	40
Availabilities	12	8	35	25	

4. A company solicits bids on each of four projects from five contractors. Only one project may be assigned to any contractor. The bids received (in thousands of rupees) are given in the accompanying table. Contractor D feels unable to carry out project 3 and therefore, submits no bid.

Project	Contractor				
	A	B	C	D	E
1	18	25	22	26	25
2	26	29	26	27	24
3	28	31	30	–	31
4	26	28	27	26	29

SECTION—C

5. Explain Game Theory. Discuss the steps of solving Game Theory problem by Dominance method by giving suitable examples.

6. A post office has two clerks, either of whom averages 1.5 minutes per customer transaction (the service time being distributed exponentially). The arrival rate of the customers to the post office is one customer per minute. Compute :

   (a) The probability that both the clerks would be idle.

   (b) The probability that there shall be one customer in the post office.

   (c) The probability that there shall be five customers in the post office.

   (d) The average number of customers waiting in the queue.

   (e) The average number of customers being served.

   (f) The average time a customer spends waiting for service.

   (g) The average time a customer spends in a post office.

SECTION—D

7. What do you understand by CPM ? State the five steps of the working methodology of critical path analysis. Can a critical path change during the course of a period ?

8. A project consists of eight activities with the following time estimates :

Activity	Immediate Predecessor	Time (Days)		
		Optimistic	Most Likely	Pessimistic
A	–	1	1	7
B	–	1	4	7
C	–	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D & E	3	6	15
H	F & G	1	2	3

Required :

(a) Draw PERT network.

(b) Find the expected time for each activity.

(c) Determine the earliest event times and latest allowable times.

(d) Determine the critical path.

(e) Determine the total slack for each activity.

(f) What is the probability that the project will be completed in (i) 22 days (ii) 18 days, (iii) 19 days ?

(g) What project duration will have 95% chance of completion ?

(h) If the average duration for activity F increases to 14 days. What will be its effect on the expected project completion time which will have 95% confidence ?