Exam. Code : 108506

Subject Code : 501093

B.Com. 6th Semester (Batch 2022-25)

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. Define Operations Research. Elucidate its characteristics and limitations.

2. Solve the following problems by Simplex method :

Max. $Z = 2x_1 + 5x_2 + 7x_3$

Subject to

$$3x_1 + 2x_2 + 4x_3 \leq 100$$

$$x_1 + 4x_2 + 2x_3 \leq 100$$

$$x_1 + x_2 + 3x_3 \leq 100$$

$$x_1, x_2, x_3 \geq 0$$

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SECTION—B

3. Solve the following transportation problem, whose cost matrix availability at each point and requirements at each warehouse are given as follows :

Plants	Warehouses				Availability
	W_1	W_2	W_3	W_4	
P_1	190	300	500	100	70
P_2	700	300	400	600	90
P_3	400	100	600	00	180
Requirements	50	80	70	140	

4. A production supervisor is considering how he should assign five jobs that are to be performed to five operators. He wants to assign the jobs to the operators in such a manner that the aggregate cost to perform the job is the

least. He has the following information about the wages paid to the operators for performing these jobs :

		Jobs				
		1	2	3	4	5
Operators	A	10	3	3	2	8
	B	9	7	8	2	7
	C	7	5	6	2	4
	D	3	5	8	2	4
	E	9	10	9	6	10

Assign the jobs to the operators so that the aggregate cost is the least.

SECTION—C

5. At a service counter of fast food joint, the customers arrive at the average interval of 6 minutes whereas the counter clerk takes on an average 5 minutes for preparation of bill and delivery of the item. Calculate the following :

(a) Utilization factor.

(b) Average waiting time of the customers at the fast food joint.

(c) Expected average waiting time in the line.

(d) Average number of customers in the service counter area.

(e) Average number of customers in the line.

(f) Probability that the counter clerk is idle.

(g) Probability of finding the clerk busy.

(h) Changes that customer is required to wait more than 30 minutes in the system.

(i) Probability of having 4 customers in the system.

(j) Probability of finding more than 3 customers in the system.

6. Using the dominance property obtain the optimal strategies for both the players and determine the value of the game. The pay off matrix for player A is given :

		Player B				
		I	II	III	IV	V
	I	2	4	3	8	4
Player A	II	5	6	3	7	8
	III	6	7	9	8	7
	IV	4	2	8	4	3

SECTION—D

7. (a) Differentiate between PERT and CPM. Give appropritate examples.

(b) A project is composed of 11 activities, the time estimates for which are given below :

Activity	A (days)	B (days)	M (days)
1–2	7	17	9
1–3	10	60	20
1–4	5	15	10
2–5	50	110	65
2–6	30	50	40

Activity	A (days)	B (days)	M (days)
3–6	50	90	55
3–7	1	9	5
4–7	40	68	48
5–8	5	15	10
6–8	20	52	27
7–8	30	50	40

(i) Draw the network diagram.

(ii) Determine the critical path.

8. Characteristics of a project schedule are given below :

Activity		Activity Time		
Tail Event i	Head Event j	Optimistic Time (t_o)	Pessimistic Time (t_p)	Most Likely Time (t_m)
1	2	1	3	2
2	3	1	7	4
2	7	2	4	3
3	4	1	5	3
3	5	0	0	0
4	6	0	0	0
5	6	3	13	5
7	8	4	12	8
6	9	4	14	6
8	9	1	3	2

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Determine :

(a) Expected activity times

(b) Earliest expected and latest expected time for each event. Gndupapers.com

(c) Draw a network and indicate the critical path on it.

(d) Determine the scheduling of activities and compute various floats.