Exam. Code : 108505
Subject Code : 2773

B.Com. Semester—V

BCG–505 : OPERATIONS RESEARCH

Time Allowed—3 Hours] [Maximum Marks—50

Note :— Question **1** is compulsory and divided into **12** parts of **1** mark each. Write short notes on any **10** parts in Question **1** from Section A. Attempt any **TWO** questions each from Section B and Section C carrying **10** marks each.

SECTION—A

(Marks : 10×1=10)

1. (a) Define Operations Research.
   (b) Give two characteristics of Operations Research.
   (c) What do you mean by Unbounded Solution ?
   (d) How you will recognise Multiple Solutions in Simplex Method of LPP ?
   (e) What is Unbalanced Transportation Problem ? How it is solved ?
   (f) What do you mean by Prohibited Assignment ?
   (g) Differentiate between Pure and Mix Strategies in Game Theory.
   (h) Write three limitations of Game Theory.
   (i) What is Jockeying in Queuing Theory ?
   (j) Arrival of cars at a filling station are considered to be Poisson with an average time 10 minutes between one arrival and the next. Length of filling petrol is assumed to be distributed exponentially, with mean 3 minutes. Find the Utilisation Ratio.

(k) A project can be completed in ₹ 2,00,000 in 25 days. It takes additional ₹ 50,000 to complete the project in 21 days. Find Cost Slope of the project.

(l) Differentiae between Float and Slack.

SECTION—B

(Marks : 2×10=20)

2. "The scope of application of Operations Research extends to other economic activities like industry and trade." In the light of this statement explain how Operations Research is useful in various economic activities.

3. Solve the following LPP with Simplex Method :

Maximize $Z = 2X_1 + X_2 + 4X_3$

subject to constraints :

$$-2X_1 + 4X_2 \leq 4$$
$$X_1 + 2X_2 + X_3 \geq 5$$
$$2X_1 + 3X_3 \leq 2$$

where $X_1, X_2 \geq 0$ and X_3 is unrestricted.

4. The relevant data on Demand Supply and Profit Per Unit of a product manufactured and sold by a company are given below :

	Outlets					
Factory	A	B	C	D	E	**Supply**
R	5	8	14	7	8	**100**
S	2	6	7	8	7	**20**
T	3	4	5	9	8	**60**
U	4	10	7	8	6	**20**
Demand	**45**	**65**	**70**	**35**	**15**	

Given that transportation from R to C and U to B are not allowed due to certain reasons. Solve the transportation problem for optimality.

5. A national car rental company has surplus of one car in each of the cities 1, 2, 3, 4, 5 and 6 and a deficit of one car each in the cities 7, 8, 9, 10, 11 and 12. The distance in miles between the cities with surplus and cities with a deficit are displayed in the table below :

Cities	7	8	9	10	11	12
1	41	72	39	52	25	51
2	22	29	49	65	81	50
3	27	39	60	51	32	32
4	45	50	48	52	37	43
5	29	40	39	26	30	33
6	82	40	40	60	51	70

How cars should be despatched so as to minimise the total mileage travelled ?

SECTION—C

(Marks : 2×10=20)

6. Summarise the procedure of solving two-person zero sum game. Also describe the significance and limitation of Game Theory.

7. At a Machine shop non-productive cost of machine is estimated to be ₹ 100 per hour. If breakdown of machines follow Poisson distribution with mean rate of 4 machines per hour and a worker can repair machines at the rate of 6 machines per hour and charges ₹ 20 per hour, what is the optimal crew size ?

8. Solve the following game :

Players	Player B				
Player A	Strategies	I	II	III	IV
	I	19	6	17	5
	II	17	3	14	6
	III	14	8	20	4
	IV	10	6	12	2

9. The table given below gives different time estimates for activities of a project :

Activities	Time Estimates in Weeks		
	t_o	t_m	t_p
1–2	3	5	13
1–3	1	2	15
2–4	6	7	8
3–4	2	5	14
2–6	2	4	12
4–5	4	6	8
4–6	5	9	13
5–7	1	2	3
6–7	1	4	7

(a) Draw the Project Diagram.

(b) Calculate Critical Path.

(c) Find the probability that project will be completed within 29 weeks.