2020

BUSINESS ADMINISTRATION — HONOURS

Paper : A501C-11

(Quantitative Techniques for Management)

Full Marks : 80

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***any five*** questions from the following.

1. Consider the following linear programming problem.

$$\text{Max} \quad Z = 2X_1 + 3X_2$$

$$\text{Subject to} \quad X_1 + X_2 \leq 1$$

$$3X_1 + X_2 \leq 4$$

$$X_1 , X_2 \geq 0$$

Solve it by Simplex Method. 16

2. A firm manufacturing two types of electrical items A and B can make a profit of ₹ 160 per unit and ₹ 240 per unit. Both A and B make use of two essential components, a motor and a transformer. Each unit of A requires 3 motors and 2 transformers and each unit B requires 2 motors and 4 transformers. The total supply of components per month is restricted to 210 motors and 300 transformers. Formulate the above as an L.P.P. and solve it graphically. 16

3. There are three sources which store a given product. The sources supply these products to four dealers. The capacities of the sources and the demands of the dealers are given :

Capacities are $S_1 = 30$, $S_2 = 50$, $S_3 = 20$,

Demands are $D_1 = 20$, $D_2 = 40$, $D_3 = 30$, $D_4 = 10$

The cost matrix is given below. Find the minimum cost of transportation by Vogel's Approximation Method.

	D_1	D_2	D_3	D_4
S_1	1	2	1	4
S_2	3	3	2	1
S_3	4	2	5	9

16

4. Find the dual of the following problem :

Maximize $Z = X_1 + 2X_2 - 3X_3$

Subject to $X_1 - 3X_2 + 4X_3 = 5$

$X_1 - 2X_2 \leq 3$

$X_1 , X_2 \geq 0$ but X_3 is unrestricted in sign. 16

5. Solve the following two – person-zero-sum game :

	Player B				
Player A	Strategies	I	II	III	IV
	I	3	–2	4	–1
	II	–3	1	2	–2
	III	2	4	2	3

16

6. Draw a network diagram and identify the critical path from the following information. Also calculate the total float for each of the activities :

Activities	**Activity Nodes**	**Duration (in days)**
A	1-2	2
B	1-3	7
C	1-4	8
D	2-5	3
E	3-6	6
F	3-6	10
G	3-7	4
H	4-6	6
I	5-7	2
J	6-8	5
K	7-8	6

8+4+4

7. Goods manufactured at three plants A, B and C are required to be transported to Sales outlets X, Y and Z. The unit costs of transporting the goods from the plants to the outlets are given below :

Sales Outlets	Plants			Total Demand
	A	B	C	
X	3	9	6	20
Y	4	4	6	40
Z	8	3	5	60
Total Supply	40	50	30	120

Compute the initial allocation and minimum cost of transportation by North-West corner rule. 16

8. The time estimate (in weeks) for the activities of a PERT network are given below :

Activity	Optimistic Time (t_o)	Most likely time (t_m)	Pessimistic time (t_p)
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	2	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

a. Draw the project network.

b. Determine the expected project length.

c. Calculate the standard deviation and variance of the project length. 5+6+5

9. Write short notes on : strategy, player, two-person zero sum game, saddle point. 16

10. An automobile workshop wishes to put four mechanics to four different jobs. The mechanics have somewhat different kinds of skills and they exhibit different levels of efficiency from one job to another. The manager of the workshop has estimated the number of manhours that would be required for each job-man combination. This is given in the matrix form in table :

Job / Mechanic	A	B	C	D
1	5	3	2	8
2	7	9	2	6
3	6	4	5	7
4	5	7	7	8

Find the optimum assignment that will result in minimum manhours needed. 16

11. A travelling salesman has to go 5 cities. He wishes to start from a particular city, visit each city once and then return to his starting point. The travelling cost for each city from a particular city is given below :

From City	To City				
	A	B	C	D	E
A	×	4	7	3	4
B	4	×	6	3	4
C	7	6	×	7	5
D	3	3	7	×	7
E	4	4	5	7	×

What is the sequence of visit of the salesman, so that the cost is minimum? 16

12. Write down the assumptions of Linear Programming. Mention and explain few application areas of Linear Programming. 16