

# Rishi Bankim Chandra Evening College

## M.Com. 2<sup>nd</sup> Semester Examination, 2023

### Quantitative Techniques

(COMPCOR09T)

Time – 2 Hours

F.M.-40

#### Group –A

Answer any *five* questions

2×5=10

1. What do you mean by Buffer inventories?
2. What do you mean by Linear Programming?
3. State two differences of PERT and CPM.
4. What is degeneracy in L.P.P?
5. Define a saddle point.
6. Define artificial variable.
7. What is critical path?
8. What do you mean by an unbalanced assignment problem?

#### Group – B

Answer any two questions, taking one each from part-I and part-II

2×5=10

##### Part-I

Answer any one question

1×5=5

9. Find the minimum transportation cost:

Source	D1	D2	D3	D4	D5	Available
S1	4	7	3	8	2	4
S2	1	4	7	3	8	7
S3	7	2	4	7	7	9
S4	4	7	2	4	7	2
Requirement	8	3	7	2	2	-

10. Solve the following LPP using Graphic Method.

$$\begin{aligned} &\text{Maximize } Z = 10x_1 + 5x_2 \\ &\text{Subject to } 4x_1 + 5x_2 \leq 100 \\ &\quad 5x_1 + 2x_2 \leq 80 \\ &\quad x_1, x_2 \geq 0 \end{aligned}$$

P.T.O.

**Part-II**

**Answer any one question**

**1×5=5**

11. Consider the following problem faced by a production planner of a soft drink plant. He has two bottling machines A and B. A is design for 8-ounce bottles and B for 16 ounce bottles. However, each can also be used for both types of bottles with same loss of efficiency. The manufacturing data is as follows:

Machines	8-ounce bottles	16 ounce bottles
A	100/minute	40/minute
B	60/minute	75/minute

The machines can run for 8 hours per day, 5 days per week. The profit on an 8 ounce bottle is Rs 1.5 and on a 16-ounce bottle is Rs 2.5. Weekly production of the drink can not exceed 3, 00,000 bottles and the market can absorb 25,000, 8-ounce bottles and 7,000, 16-ounce bottles per week. The planner wishes to maximize his profit, subject of course, to all the production and marketing restrictions. Formulate this problem as an LP model to maximize total profit.

12. Solve the game whose payoff matrix is given below:

Player	Player B			
	A	B1	B2	B3
A1	3	2	4	0
A2	3	4	2	4
A3	4	2	4	0
A4	0	4	0	8

**Group-C**

**Answer any two questions, taking one each from part-I and part-II**

**2×10=20**

**Part-I**

**Answer any one question.**

**1×10=10**

13.a) Use penalty method to solve the following LPP.

P.T.O.

Minimize  $Z = x_1 + 2x_2 + 3x_3 - x_4$

Subject to the constraints:

$$x_1 + 2x_2 + 3x_3 = 15$$

$$2x_1 + x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

$$x_1, x_2, x_3, x_4 \geq 0.$$

b) For what value of  $\gamma$ , the game with following pay-off matrix is strictly determinable?

		Player B		
		B1	B2	B3
Player A	A1	$\gamma$	6	2
	A2	-1	$\gamma$	-7
	A3	-2	4	$\gamma$

**8+2=10**

14.a) A small project is composed of seven activities, Whose time estimates are listed in the table as follows:

Activity(i-j)	Optimistic(days)	Most likely(days)	Pessimistic(days)
1-2	1	2	3
1-3	3	4	5
1-4	6	7	8
2-5	7	8	9
3-5	8	9	10
4-6	9	10	11
5-6	11	12	13

- i) Draw a project network.
- ii) Find the critical path and determine the expected project length.
- iii) Calculate standard deviation and the variance of the project length.

**3+4+3=10**

**Part-II**

**Answer any one question.**

**1×10=10**

15.a) What are the basic objectives of Transportation Problem?

b) Determine the optimal solution to the problem given below:

To Market		M1	M2	M3	M4	Supply
From plant	P1	6	4	9	1	40
	P2	20	6	11	3	40
	P3	7	1	0	14	50
	P4	7	1	12	6	90
Demand		90	30	50	30	

**3+7=10**

16. a) The production department of a company requires 3600 kg of raw material for manufacturing a particular item per year. It has been estimated that cost of placing an order is Rs. 36 and the cost of carrying inventory is 25 per cent of the investment in the inventories. The price is Rs 10 per kg. Help the purchase manager to determine an ordering policy for the raw material.

b) Write the dual of the following problem:

$$\text{Max } Z = x + 2y$$

$$\text{Subject to } 2x + 3y \geq 4$$

$$3x + 4y = 5$$

$$x \geq 0 \text{ and } y \text{ unrestricted.}$$

**6+4=10**