

M.Com. 1st Semester Examination, 2023

COMMERCE

(Quantitative Techniques for Managerial Decisions)

PAPER – COM-104

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate marks

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

COM-104.1

1. Answer any *two* of the following : 5 × 2

(a) Obtain the dual of the following Primal problem :

$$\text{Minimize } Z = 3X_1 - 2X_2 + 4X_3$$

$$\text{Subject to, } 3X_1 + 5X_2 + 4X_3 \geq 7$$

$$6X_1 + X_2 + 3X_3 \geq 4$$

$$7X_1 - 2X_2 - X_3 \leq 10$$

$$X_1 + 2X_2 + 5X_3 \geq 3$$

$$4X_1 + 7X_2 - 2X_3 \geq 2$$

Provided that $X_1, X_2, X_3 \geq 0$

- (b) What is unbalanced assignment problem? How can an unbalanced problem be converted to a balanced problem? 1 + 4
- (c) From the following transportation problem calculate initial transportation cost using Vogel's approximation method :

| Plants | A | B | C | Availability |
|-------------|-----|-----|----|--------------|
| W | 8 | 16 | 16 | 152 |
| X | 32 | 48 | 32 | 164 |
| Y | 16 | 32 | 48 | 154 |
| Requirement | 144 | 204 | 82 | |

2. Answer any one of the following : 10×1

- (a) Four salesmen are to be assigned to four districts. Estimates of the sales revenue in Rs.'000 for each salesman are as under :

| Salesman | Districts | | | |
|----------|-----------|-----|-----|-----|
| | A | B | C | D |
| 1 | 320 | 350 | 400 | 280 |
| 2 | 400 | 250 | 300 | 220 |
| 3 | 420 | 270 | 340 | 300 |
| 4 | 250 | 390 | 410 | 350 |

Give the optimal assignment pattern that maximizes the sales revenue.

- (b) Solve the following L.P.P. using Simplex method

$$\text{Min } Z = 5X_1 + 3X_2$$

$$\text{Subject to, } 3X_1 + 2X_2 \geq 40$$

$$X_1 + 2X_2 \geq 20$$

$$\text{Provided that } X_1, X_2 \geq 0. \quad 10$$

COM-104.2

3. Answer any *two* questions from the following: 5 × 2

(a) How is network analysis helpful in project implementation? Briefly state any two errors associated with the network analysis. 3 + 2

(b) Mention any three important considerations to be kept in mind while taking inventory decisions. What do you mean by Stock-out Costs? 3 + 2

(c) In a factory the average breakdown rate is 3 per hour. The idle time cost is estimated at Rs. 16 per hour. The factory

works 8 hours a day. The factory manager is considering two machines for repairing purpose. Machine A takes, on an average, 15 minutes in repairing a machine and demand wages of Rs. 8 per hour. Machine B takes 10 minutes only but demands Rs. 10 as wages per hour.

Assuming that the machine breakdown rate is Poisson distributed and the repair times follow Exponential distribution, which of the two machines should be engaged ?

5

4. Answer any *one* question from the following :

10 × 1

(a) A small project consists of six activities with the following information :

| Activity (i → j) | Normal duration (days) | Crash duration (days) | Crashing cost (Rs. Per day) |
|---------------------|---------------------------|--------------------------|--------------------------------|
| 1-2 | 9 | 6 | 20 |
| 1-3 | 8 | 5 | 25 |
| 1-4 | 15 | 10 | 30 |
| 2-4 | 5 | 3 | 10 |
| 3-4 | 10 | 6 | 15 |
| 4-5 | 2 | 1 | 40 |

- (i) Draw the network and obtain normal and minimum project durations.
- (ii) Find the additional cost of the project for the minimum project duration.
- (iii) Find the optimum duration if overhead cost is Rs. 60 per day. $4 + 3 + 3$

(b) Write short notes on : $2\frac{1}{2} \times 4$

- (i) Crashing in network analysis
- (ii) Price break in inventory control
- (iii) Customers' behaviour in queuing theory
- (iv) PERT in network analysis.

[Internal Assessment – 10 Marks]
