H Roll No. .....

# MB–202

## M. B A. (SECOND SEMESTER)

## END SEMESTER

## EXAMINATION, 2021-22

### QUANTITATIVE TECHNIQUES

**Time : Three Hours**

**Maximum Marks : 100**

**Note :** (i) This question paper contains two Sections–Section A and Section B.

(ii) Both Sections are compulsory.

(iii) Answer any *two* sub-questions among (a), (b) and (c) in each main question of Section A. Each question carries 10 marks.

(iv) Section B consisting of Case Study is compulsory. Section B is of 20 marks.

*P. T. O.*

## Section—A

1. (a) Write down the advantages and limitations of operation research. 10 (CO1)

(b) Maximize : 10 (CO1)

$$Z = 5X_1 + 3X_2$$

subject to constraints

$$3X_1 + 5X_2 \leq 15$$

$$5X_1 + 2X_2 \leq 10$$

and $X_1, X_2 \geq 0$.

(c) What do you mean by LPP ? What are its limitations ? Use penalty (or Big-M) method to maximize : 10 (CO1)

$$z = 3x_1 - x_2$$

Subject to the constraints :

$$2x_1 + x_2 \geq 2;$$

$$x_1 + 3x_2 \leq 3;$$

$$x_2 \leq 4 \text{ and } x_1, x_2 \geq 0.$$



2. (a) Solve the following by row minima method : 10 (CO2)

| Origin \ Destination | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Availability |
|---|---|---|---|---|---|
| $O_1$ | 1 | 2 | 1 | 4 | 30 |
| $O_2$ | 3 | 3 | 2 | 1 | 40 |
| $O_3$ | 4 | 2 | 5 | 9 | 30 |
| $O_4$ | 5 | 3 | 6 | 10 | 20 |
| Requirements | 10 | 30 | 20 | 40 | |

(b) What are assignment, transportation and trans-shipment models ? 10 (CO2)

(c) Solve the following problem by using Hungarian assignment problem : 10 (CO2)

| | A | B | C | D | E |
|---|---|---|---|---|---|
| I | 4 | 6 | 7 | 5 | 11 |
| II | 7 | 3 | 6 | 9 | 5 |
| III | 8 | 5 | 4 | 6 | 9 |
| IV | 9 | 12 | 7 | 11 | 10 |
| V | 7 | 5 | 9 | 8 | 11 |

3. (a) In a service department manned by one server, on an average 8 customers arrive every 5 minutes while the server can serve 10 customers in the same time assuming Poisson distribution for arrival and exponential distribution for service rate. Determine : 10 (CO3)

(i) Average number of customers in the system.

(ii) Average number of customers in the queue.

(iii) Average time a customer spends in the system.

(iv) Average time a customer waits before being served.

(b) State the different problems occurs in inventory control. 10 (CO3)

(c) Discuss Queuing theory in detail. 10 (CO3)



4. (a) Consider the game with the following payoff : 10 (CO4)

| | B1 | B2 |
|---|---|---|
| A1 | 2 | 6 |
| A2 | −2 | G |

Show that game is strictly determinable whatever G will be. Also find the value of game.

(b) Discuss game theory in detail. 10 (CO4)

(c) Describe the EOQ problem with one price break. 10 (CO4)

**Section—B**

5. **Case Study :** (20 Marks)

A manufacturer purchases items in lots of 800 units which is a four months requirement. The cost per unit is ₹ 100 and the ordering cost is ₹ 120 per patch order. The inventory carrying cost is estimated as 20% of the average inventory investment.

Questions :

(i) Determine the annual variable cost managing the inventory.

(ii) How much saving can be obtained from the EOQ purchases ? (CO5)