

Reg. No. :

Code No. : 5527

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M.Com. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Second Semester

Commerce – Core

QUANTITATIVE TECHNIQUES

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. In a L.P.P. if a constraint imposes on extra restriction and does not affect the solution is called
 - (a) non-negative constraint
 - (b) redundant constraint
 - (c) maximal constraint
 - (d) minimal constraint

2. The variables which are subtracted from the left hand side of the constraints involving $sign(\geq)$ to convert them in to strict equalities are called
 - (a) Slack variables
 - (b) Artificial variables
 - (c) Surplus variables
 - (d) Random variables
3. The transportation problem is said to be unbalanced if
 - (a) $\sum a_i \neq \sum b_j$
 - (b) $\sum a_i = \sum b_j$
 - (c) $\sum a_i < \sum b_j$
 - (d) $\sum a_i > \sum b_j$
4. The number of non-basic variables in an $m \times n$ balanced transportation problem is atleast
 - (a) $mn + (m + n - 1)$
 - (b) $mn - (m - n + 1)$
 - (c) $mn - (m - n - 1)$
 - (d) $mn - (m + n - 1)$
5. An Assignment problem is said to be unbalanced if
 - (a) number of rows \neq number of columns
 - (b) number of rows = number of columns
 - (c) number of rows < number of columns
 - (d) number of rows > number of columns

6. The Assignment problem can be stated in the form of $m \times n$ matrix is called
 - (a) row matrix
 - (b) column matrix
 - (c) cost matrix
 - (d) singular matrix
7. _____ are some accomplishments that occur at a recognisable point in time.
 - (a) events
 - (b) activity
 - (c) project
 - (d) nodes
8. When the waiting customer leaves the Queue due to impatience is called?
 - (a) Balking
 - (b) Priorities
 - (c) Reneging
 - (d) Jockeying
9. The discount rate is
 - (a) $V = (1 - r)^{-1}$
 - (b) $V = (1 - r)^{-1}$
 - (c) $V = (1 + r)^2$
 - (d) $V = (1 - r)^3$
10. An imitation of reality is called
 - (a) Queueing model
 - (b) Transportation model
 - (c) Simulation
 - (d) Replacement model

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Write the procedure for forming a Linear programming model.

Or

- (b) A company produces refrigerators in Unit I and heaters in Unit II. The two products are produced and sold on a weekly basis. The weekly production cannot exceed 25 in Unit I and 36 in Unit II, due to constraints 60 workers are employed. A refrigerator requires 2 man-week of labour while a heater requires 1 man-week of labour. The profit available is Rs. 600 per refrigerator and Rs. 400 per heater. Formulate the L.P.P.

12. (a) Write the procedure to find the initial basic feasible solution by Least Cost method.

Or

- (b) Find the initial basic feasible solution for the following transportation problem by Vogel's approximation method.

Distribution centres

| | | Distribution centres | | | | Availability |
|--------|----------------|----------------------|----------------|----------------|----------------|--------------|
| | | D ₁ | D ₂ | D ₃ | D ₄ | |
| Origin | S ₁ | 11 | 13 | 17 | 14 | 250 |
| | S ₂ | 16 | 18 | 14 | 10 | 300 |
| | S ₃ | 21 | 24 | 13 | 10 | 400 |

Requirements 200 225 275 250

13. (a) What is meant by unbalance Assignment problem? How it can be solve it?

Or

- (b) Write the difference between transportation problem and Assignment problem.
14. (a) If there are five activities P, Q, R, S and T such that P, Q, R have no immediate predecessors but S and T have immediate predecessors P, Q and Q, R respectively. Represent this situation by a network?

Or

- (b) Explain the term Queue discipline.

15. (a) Explain the terms :
- Present worth factor and
 - Discount rate.

Or

- (b) Write the Limitation of Simulation?

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Solve the following L.P.P by the graphical method :

$$\text{Maximize } z = 3x_1 + 2x_2$$

Subject to

$$-2x_1 + x_2 \leq 1$$

$$x_1 \leq 2$$

$$x_1 + x_2 \leq 3$$

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

Or

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

$$\text{Minimize } z = 8x_1 - 2x_2$$

Subject to

$$-4x_1 + 2x_2 \leq 1$$

$$5x_1 - 4x_2 \leq 3$$

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

17. (a) Obtain an optimum basic feasible solution to the following transportation problem

| | To | | | Available |
|--------|----|---|---|-----------|
| From | 7 | 3 | 2 | 2 |
| | 2 | 1 | 3 | 3 |
| | 3 | 4 | 6 | 5 |
| Demand | 4 | 1 | 5 | 10 |

Or

- (b) Find the stating solution of the following transportation problem using

- (i) North West Corner rule and

- (ii) Least cost method.

| | | | |
|----|----|----|----|
| 1 | 2 | 6 | 7 |
| 0 | 4 | 2 | 12 |
| 3 | 1 | 5 | 11 |
| 10 | 10 | 10 | |

18. (a) The assignment cost of assigning any one operator to any one machine is given in the following table

| | | Operators | | | |
|---------|---|-----------|----|-----|----|
| | | I | II | III | IV |
| Machine | A | 10 | 5 | 13 | 15 |
| | B | 3 | 9 | 18 | 3 |
| | C | 10 | 7 | 3 | 2 |
| | D | 5 | 11 | 9 | 7 |

Find the optimal assignment by Hungarian method.

Or

- (b) Solve the assignment problem for maximization given the profit matrix is

| | | Machines | | | |
|-----|---|----------|----|----|----|
| | | A | B | C | D |
| Job | A | 51 | 53 | 54 | 50 |
| | B | 47 | 50 | 48 | 50 |
| | C | 49 | 50 | 60 | 61 |
| | D | 63 | 64 | 60 | 60 |

19. (a) Calculate the total float, free float and independent float for the project whose activities are given below

| | | | | | |
|------------------|-----|-----|-----|-----|-----|
| Activity | 1-2 | 1-3 | 1-5 | 2-3 | 2-4 |
| Duration (weeks) | 8 | 7 | 12 | 4 | 10 |
| Activity | 3-4 | 3-5 | 3-6 | 4-6 | 5-6 |
| Duration (weeks) | 3 | 5 | 10 | 7 | 4 |

Or

- (b) In a railway Marshalling Yard, goods train arrive at a rate of 30 Trains per day. Assuming that inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average of 36 minutes. Calculate the following.

- The mean Queue Size
- The probability that the Queue Size exceeds 10
- If the input of the Train increases to an average 33 per day, what will be the changes in (i) and (ii).

20. (a) The cost of a machine is Rs. 6,100 and its scrap value is Rs. 100. The maintenance costs found from experience are as follows :

| | | | | |
|-----------------|-----|------|------|------|
| Year | 1 | 2 | 3 | 4 |
| Main Cost (Rs.) | 100 | 250 | 400 | 600 |
| Year | 5 | 6 | 7 | 8 |
| Main Cost (Rs.) | 900 | 1200 | 1600 | 2000 |

What should the machine be replace?

Or

- (b) Suppose that the demand for a particular item is normally distributed with a mean of 175 units and standard of 25 units per day. Simulate the demand for the next 20 days.
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