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# P.E.S. College of Engineering, Mandya - 571 401

*(An Autonomous Institution affiliated to VTU, Belagavi)*

**Second Semester, Master of Business Administration (MBA)**

**Semester End Examination; October - 2023**

**Quantitative Techniques**

*Time: 3 hrs* *Max. Marks: 100*

***Note**: i) Answer all **FOUR** full questions from **PART - A** and **PART - B** (Case Study) is compulsory.*
*ii) Scientific calculator shall be allowed.*

| Q. No. | Questions | Marks | BLs | COs | POs |
|---|---|---|---|---|---|
| | **PART - A** | | | | |
| 1 a. | Discuss the significance of operation research in the current business scenario. | 10 | L3 | CO1 | PO1 |
| b. | Solve the following LLP by Graphical method;<br>Minimize $Z = 20x_1 + 10x_2$<br>Subject to<br>$x_1 + 2x_2 \leq 40$<br>$3x_1 + x_2 \geq 30$<br>$4x_1 + 3x_2 \geq 60$<br>$x_1, x_2 \geq 0$ | 10 | L3 | CO1 | PO2,4 |
| | **OR** | | | | |
| 2 a. | Explain the applications of linear programming problem in different areas. | 10 | L4 | CO1 | PO1 |
| b. | A plant manufacturers two products A and B the profit contribution of each product has been estimated as Rs. 20 for product A and Rs 24 for product B, each product passes through three departments of the plant, the time require for each product and total time available in each department are as follows. | 10 | L6 | CO1 | PO2,5 |

| Department | Hours required | | Available hours during the month |
|---|---|---|---|
| | Product A | Product B | |
| 1 | 2 | 3 | 1,500 |
| 2 | 3 | 2 | 1,500 |
| 3 | 1 | 1 | 600 |

The company has a contract to supply at least 250 units of products B per month. Formulate the problem as liner programming model.

| | | | | | |
|---|---|---|---|---|---|
| 3 a. | Explain the steps involved in V.A.M. | 10 | L2 | CO2 | PO1 |

Contd….2

b. Four different jobs can be done on four different machines and take down time cost are prohibitively high for charge overs. The matrix below gives the cost in rupees of producing jobs *i* and machine *j*

| Jobs | Machines | | | |
|---|---|---|---|---|
| | $M_1$ | $M_2$ | $M_3$ | $M_4$ |
| $J_1$ | 5 | 7 | 11 | 6 |
| $J_2$ | 8 | 5 | 9 | 6 |
| $J_3$ | 4 | 7 | 10 | 7 |
| $J_4$ | 10 | 4 | 8 | 3 |

How the jobs should be assigned to the various machines so that the total cost in minimized?

10 L2 CO2 PO2,5

**OR**

4 a. Examine the initial solution to the following transportation problem by V.A.M.

| Destination | | | | | | |
|---|---|---|---|---|---|---|
| Factory | | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
| | $F_1$ | 3 | 3 | 4 | 1 | 100 |
| | $F_2$ | 4 | 2 | 4 | 2 | 125 |
| | $F_3$ | 1 | 5 | 3 | 2 | 75 |
| | Demand | 120 | 80 | 75 | 25 | 300 |

10 L4 CO2 PO2,5

b. Elucidate the concept of Hungarian method and the steps for solving assignment problem under Hungarian method.

10 L2 CO2 PO1

5 a. Determine solution of game theory problem using dominance method,

| Player A / Player B | $B_1$ | $B_2$ | $B_3$ | $B_4$ |
|---|---|---|---|---|
| $A_1$ | 3 | 5 | 4 | 2 |
| $A_2$ | 5 | 6 | 2 | 4 |
| $A_3$ | 2 | 1 | 4 | 0 |
| $A_4$ | 3 | 3 | 5 | 2 |

10 L4 CO3 PO2

b. Explain characteristics and classification of Queuing Models.

10 L2 CO3 PO1

**OR**

6 a. Elucidate the concept of minimax and maximin principal used in the Game theory with suitable example.

10 L3 CO3 PO1

Contd….3

b. An insurance company has 3 clerks in its branch office. People arrive with claims against the company are found to arrive in a poission fashion at an average of 20 per 8 hours a day. The amount of time that a clerk spends with the client is found to have ED with a mean time of 40 mins. The clients are processed in the order of their appearance.

i) How many hours a week can a clerk expect to spend with the clients?

ii) How much time on an average does a client spend in the branch office?

10 L5 CO3 PO2

7 a. The Lajwaab bakery shop keeps stock of a popular brand of cake. Previous experience indicates the daily demand as

| Daily demand | Probability |
|---|---|
| 0 | 0.01 |
| 15 | 0.15 |
| 25 | 0.2 |
| 35 | 0.5 |
| 45 | 0.12 |
| 50 | 0.02 |

Consider the following sequence of random number:

21, 27, 47, 54, 60, 39, 43, 91, 25, 20

Using this sequence, simulate the demand for the next 10 days. Find out the stock situation, if the owner of the bakery shop decides to make 30 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data

10 L 3 CO3 PO2

b. Discuss the difference between PERT and CPM. 10 L4 CO4 PO5

**OR**

8 a. Explain the advantages and disadvantages of simulation. 10 L2 CO3 PO1

Contd….4

b. A small project consisting of eight activities has the following characteristics:

| Activity | Preceding activity | Most optimistic time (a) | Most likely time (m) | Most pessimistic time (b) |
|---|---|---|---|---|
| A | None | 2 | 4 | 12 |
| B | None | 10 | 12 | 26 |
| C | A | 8 | 9 | 10 |
| D | A | 10 | 15 | 20 |
| E | A | 7 | 7.5 | 11 |
| F | B, C | 9 | 9 | 9 |
| G | D | 3 | 3.5 | 7 |
| H | E, F, G | 5 | 5 | 5 |

10 L2 CO2 PO5

i) Construct the PERT network for the project

ii) Prepare the activity schedule for the project

iii) Determine the critical path

**PART - B (Case Study is Compulsory)**

9. Solve the following assignment problem. Cell values represent cost of assigning job A, B, C and D to the machines I, II, III and IV

Machines

| Jobs | I | II | III | IV |
|---|---|---|---|---|
| A | 10 | 12 | 19 | 11 |
| B | 5 | 10 | 7 | 8 |
| C | 12 | 14 | 13 | 11 |
| D | 8 | 15 | 11 | 9 |

20 L3 CO2 PO5

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