**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034.**

**B. Sc., DEGREE EXAMINATION - Mathematics**

**FIFTH SEMESTER**

**PART – A**

***Answer all questions.* (10 X 2 = 20 marks)**

1. Give any two application areas of a linear programming problem.
2. Define iso – profit and iso – cost lines.
3. Give the mathematical model of a transportation problem.
4. What is opportunity cost in an assignment problem?
5. Define value of a game. When is a game said to be fair?
6. Give two examples of situations where game theory is used.
7. Define activity variance and project variance.
8. Define critical path of a network.
9. What is buffer inventory?
10. Define carrying cost of inventory.

**PART – B**

***Answer any FIVE questions.*  (5 X 8 = 40 marks)**

1. a) How do you find the dual of a linear programming problem.
2. Find the dual of the LPP : Minimize subject to the constraints , , , , , .
3. Obtain an initial feasible solution to the following transportation problem using the least cost rule –

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | D1 | D2 | D3 | Availability |
| S1 | 1 | 2 | 6 | 7 |
| S2 | 8 | 4 | 2 | 12 |
| S3 | 3 | 7 | 5 | 11 |
| Demand | 10 | 10 | 10 |  |

1. Players A and B play a game in which each has three coins, a 5p,10p and a 20p. Each selects a coin without the knowledge of the other ’s choice. If the sum of the coins is an odd amount, then A wins B’s coin. But, if the sum is even, then B wins A’s coin. Find the best strategy for each player and the values of the game.
2. Draw the network for the following set of activities:

Activity : A B C D E F G H I

Immediate predecessor: - - - A B,C A C D,E,F D

1. A company operating 50 weeks in a year is concerned about its stocks of copper cable. This costs Rs. 240 a meter and there is a demand for 8,000 meters a week. Each replenishment costs Rs. 1,050 for administration and Rs. 1,650 for delivery, while holding costs are estimated at 25 per cent of value held a year. Assuming no shortages are allowed, what is the optimal inventory policy for the company?
2. What are the major assumptions and limitations of a LPP? Discuss in detail.
3. The assignment costs of four operators to four machines are given in the following table:

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

Find the optimal assignment.

1. A factory requires 1,500 units of an item per month, each costing Rs. 27. The cost per order is Rs. 150 and the inventory carrying charges working out to 20 per cent of the average inventory. Find the economic order quantity and the number of orders per year. Would you accept a 2 per cent discount on a minimum supply quantity of 1,200 units? Compare the total costs in both the cases.

**PART – C**

***Answer any TWO questions.* (2 X 20= 40 marks)**

1. a) Solve by simplex method: Maximize , , , , , 

b) Explain the graphical method of solving a LPP.

1. a) What is meant by unbalanced transportation problem? Explain the method of solving

such a problem.

b) Solve the travelling salesman problem with the following cost matrix:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | City A | City B | City C | City D |
| City A | ∞ | 46 | 16 | 40 |
| City B | 41 | ∞ | 50 | 40 |
| City C | 82 | 32 | ∞ | 60 |
| City D | 40 | 40 | 36 | ∞ |

1. a) Solve the following game using graphical method:

|  |  |  |
| --- | --- | --- |
|  | B1 | B2 |
| A1 | 1 | -3 |
| A2 | 3 | 5 |
| A3 | -1 | 6 |
| A4 | 4 | 1 |
| A5 | 2 | 2 |
| A6 | -5 | 0 |

b) A project has the following data:

|  |  |
| --- | --- |
| Activity | A B C D E F G H |
| to  tm  tp | 4 8 4 1 2 4 10 18  5 12 5 3 2 5 14 20  6 16 12 5 2 6 18 34 |

A < C; B < D; A, D < E; B < F; C, E, F < G; G < H. (i) Draw the network, (ii) Find the critical path and the expected time of completion of the project, (iii) What is the probability that the project would completed in 60 days?

1. a) Explain the EOQ model with constant demand and variable order cycle time.

b) A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He

can produce 25, 000 bearings per day. The holding cost is Rs. 2 per year and the set –

up cost is Rs. 180. How frequently should the production run be made?

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