**B.Sc. DEGREE EXAMINATION, NOVEMBER 2016.**

**III YEAR — V SEMESTER**

**Major Paper XII— OPERATIONS RESEARCH-II**

**Time : 3 hours Max. Marks : 60**

**SECTION A — (10 × 1 = 10 marks)**

**Answer any *TEN* questions.**

1. Define LPP.
2. Write the dual of the LPP.

*Min Z = 8 X1 + 4 X2 + 18 X3*

*Solve to X1 + 3 X2  ≥ 9*

*X2 + 2 X3  ≥ 4*

*X1 , x2, x3 ≥ 0*

1. Define Unbalanced Transportation Problem.
2. What is degeneracy in Transportation Problem?
3. What is Travelling Salesman Problem?
4. Write down the Mathematical formulation for an Assignment problem.
5. Define CPM.
6. Define Independent Float.
7. Write any 2 Fulkerson’s rules for constructing a project Network.
8. Draw the Network for the project whose activities are given below.

Activities : A B C D E F G H I

Predecessor - AA - D B,C,E F E GH

1. Name any 2 types of Replacement Policies.
2. Define Money Value.

**SECTION B — (5 × 4 = 20 marks)**

**Answer any *FIVE* questions.**

1. Explain the theory of Dual Simplex Algorithm.
2. Obtain an IBFS to the following Transportation Problem using Least Cost Method.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | SUPPLY |
| P | 10 | 20 | 5 | 7 | 10 |
| Q | 13 | 9 | 12 | 8 | 20 |
| R | 4 | 5 | 7 | 9 | 30 |
| S | 14 | 7 | 1 | 0 | 40 |
| T | 3 | 12 | 5 | 19 | 50 |
| DEMAND | 60 | 60 | 20 | 10 |  |

1. Explain Travelling Salesman Problem.
2. Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows.

JOBS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 |
| A | 9 | 22 | 58 | 11 | 19 |
| B | 43 | 78 | 72 | 50 | 63 |
| C | 41 | 28 | 91 | 37 | 45 |
| D | 74 | 42 | 27 | 49 | 39 |
| E | 36 | 11 | 57 | 22 | 25 |

Determine the Optimum assignment schedule.

[P.T.O.]

1. Distinguish between CPM and PERT.

Calculate the earliest start, earliest finish, latest start and latest finish of each activity of the project given below and determine the Critical Path of the Project.

Activity 0-1 1-2 1-3 2-4 2-5 3-4 3-6 4-7 5-7 5-6 6-7

Duration (in weeks) 3 8 1 2 6 3 3 8 5 3 8

1. A Machine owner finds from his past records that the costs per year of maintaining a machine whose purchase price is Rs.6000 are as given below :

Year 1 2 3 4 5 6

Maintenance Cost (`) 1000 1200 1400 1800 2300 2800

Resale Value (`) 3000 1500 750 375 200 200

Determine at what age is replacement due?

**SECTION C — (3 × 10 = 30 marks)**

**Answer any *THREE* questions.**

1. Use Duality to solve the following LPP.

Min Z = 2 x1 + x2

Subject to 3 x1 + x2 ≥ 3

4 x1 + 3 x2 ≥ 6

x1 + x2x2 ≥ 3

x1 , x2 ≥ 0.

1. Solve the Transportation Problem.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | Supply |
| I | 6 | 1 | 9 | 3 | 70 |
| II | 11 | 5 | 2 | 8 | 55 |
| III | 10 | 12 | 4 | 7 | 70 |
| Demand | 85 | 35 | 50 | 45 |  |

1. Solve the following travelling salesman problem so as to minimize the cost per cycle.

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

1. A project consists of the following activities and time estimates :

(a) Draw the network, (b) Find the Critical Path

(c) Determine the Expected standard deviation of the completion time.

|  |  |  |  |
| --- | --- | --- | --- |
| Activity | Optimistic Time  a | Most likely time  m | Pessimistic Time  b |
| 1 - 2 | 2 | 4 | 5 |
| 1 - 3 | 3 | 4 | 6 |
| 1 - 4 | 4 | 5 | 6 |
| 2 - 4 | 8 | 9 | 11 |
| 2 - 5 | 6 | 8 | 12 |
| 3 - 5 | 2 | 3 | 4 |
| 4 - 5 | 2 | 5 | 7 |

1. Let the value of the money be 10% per year and suppose that machine A is replaced after every 3 years whereas machine B is replaced after every six year.

The yearly cost of both machines are given as under

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Age | 1 | 2 | 3 | 4 | 5 | 6 |
| MachineA | 1000 | 200 | 400 | 1000 | 200 | 400 |
| MachineB | 1700 | 100 | 200 | 300 | 400 | 500 |

Determine which machine should be purchased?

——————