**B.Sc. DEGREE EXAMINATION, NOVEMBER 2015.**

**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. What is duality in LPP?
2. Write down the Mathematical formulation of dual in LPP.
3. Write the dual of the following LPP

Min *Z = 4 x1 + 6 x2 + 18 x3*

*S.to x1+3 x2 ≥ 3*

*X2 + 2 x3 ≥ 5*

*X1, x2, x3 ≥ 0*

1. Write any 2 methods of finding an Initial Basic Feasible Solution in Transportation Problem.
2. Define Unbalanced Transportation Problem.
3. Give the mathematical formulation of Assignment Problem.
4. Define PERT.
5. What is travelling salesman problem?
6. Write any 2 Fulkerson’s rules for constructing a project Network.
7. Draw the Network for the project whose activities are given below.

Activities A B C D E F G H I J K

Predecessor - - - A B B C D E H,I F,G

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 North West Corner Rule.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E | SUPPLY |
| P | 2 | 11 | 10 | 3 | 7 | 4 |
| Q | 1 | 4 | 7 | 2 | 1 | 8 |
| R | 3 | 9 | 4 | 8 | 12 | 9 |
| DEMAND | 3 | 3 | 4 | 5 | 6 |  |

1. Define (i) slack variable (ii) surplus variable.
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 | 8 | 4 | 2 | 6 | 1 |
| B | 0 | 9 | 5 | 5 | 4 |
| C | 3 | 8 | 9 | 2 | 6 |
| D | 4 | 3 | 1 | 0 | 3 |
| E | 9 | 5 | 8 | 9 | 5 |

Determine the Optimum assignment schedule.

1. Distinguish between CPM and PERT.
2. Determine the Critical Path of the Project given below:

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

Duration

(in weeks) 8 7 12 4 10 3 5 10 7 4

[P.T.O.]

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 (Rs.) 1000 1200 1400 1800 2300 2800

Resale Value(Rs.) 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 + 2 x2

S.to 2x1 + 4 x2 ≥ 1

-x1 – 2 x2 ≤ -1

2 x1 + x2 ≥ 1

x1 , x2 ≥ 0

1. Solve the Transportation Problem.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | Supply |
| I | 21 | 16 | 25 | 13 | 11 |
| II | 17 | 18 | 14 | 23 | 13 |
| III | 32 | 27 | 18 | 41 | 19 |
| Demand | 6 | 10 | 12 | 15 |  |

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E |
| A | - | 3 | 6 | 2 | 3 |
| B | 3 | - | 5 | 2 | 3 |
| C | 6 | 5 | - | 6 | 4 |
| D | 2 | 2 | 6 | - | 6 |
| E | 3 | 3 | 4 | 6 | - |

1. A project consists of the following activities and time estimates :
2. Draw the network
3. What is the probability that the project will be completed in 27 days?

|  |  |  |  |
| --- | --- | --- | --- |
| Activity | Least time (days) | Greatest time (days) | Most likely time (days) |
| 1 - 2 | 3 | 15 | 6 |
| 2 - 3 | 2 | 14 | 5 |
| 1 - 4 | 6 | 30 | 12 |
| 2 - 5 | 2 | 8 | 5 |
| 2 - 6 | 5 | 17 | 11 |
| 3 - 6 | 3 | 15 | 6 |
| 4 - 7 | 3 | 27 | 9 |
| 5 - 7 | 1 | 7 | 4 |
| 6 - 7 | 2 | 8 | 5 |

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?