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

**III YEAR — VI SEMESTER**

 **Major Paper XII— OPERATIONS RESEARCH**

**Time : 3 hours Max. marks : 75**

**SECTION A — (10 × 2 = 20 marks)**

**Answer any *TEN* questions.**

1. **Define decision variables.**
2. **Define feasible solution.**
3. **What is degeneracy in transportation problem?**
4. **What is an assignment problem?**
5. **Under what condition can 3 machine n jobs be reduced to 2 machine n jobs?**
6. **Define value of a game.**
7. **What is a critical path?**
8. **Define free float.**
9. **What is group replacement policy?**
10. **What are the two types of failures that are considered in replacement theory?**
11. **Define optimal solution of transportation problem.**
12. **Define two person zero sum game.**

**SECTION B — (5 × 5 = 25 marks)**

**Answer any *FIVE* questions.**

1. **Solve using graphical method.**

***Max z = x + 3y***

**Subject to**

 ***2x + y ≤ 20***

 ***x + 2y ≤ 20***

 ***x, y ≥ 0.***

1. **Find the optimum assignment of jobs to machines and the corresponding time.**

 **Machines**

 **A B C D**

 **I 42 35 28 21**

**Jobs II 30 25 20 15**

 **III 30 25 20 15**

 **IV 24 20 16 12**

1. **Using the principle of Dominance solve the following game.**
2. **10 9 14**

 **10 11 8 12**

 **13 12 14 13**

1. **The following data are the characteristics of a project.**

**Activity : A B C D E F**

**Immediate**

**Predecessors: - A A B,C - E**

**Duration in Days : 2 3 4 6 2 8**

**Draw the network diagram and find the critical path and minimum project completion time.**

[P.T.O.]

1. **The cost pattern for two machines A and B when money value is not considered is given below.**

|  |  |
| --- | --- |
|  **Year** | **Cost at the beginning of the year** |
| **Machine A** | **Machine B** |
| **1** | **5000** | **8000** |
| **2** | **3000** | **1000** |
| **3** | **2000** | **1000** |

**Find the cost pattern for each machine when money is worth 10% per year and hence find which machine is less costly?**

1. **Find the initial feasible solution for the following transportation problem using Vogel’s approximation method.**

|  |  |  |
| --- | --- | --- |
|  |  **To** | **Availabilities** |
| **From** | **16** | **19** | **12** | **14** |
| **22** | **13** | **19** | **16** |
| **14** | **28** | **8** | **12** |
| **Requirements** | **10** | **15** | **17** |  |

1. **Determine the sequence for the 5 jobs that will minimise the total elapsed time.**

**Job: 1 2 3 4 5**

**Machine A: 10 2 18 6 20**

 **Machine B: 4 12 14 16 8**

 **SECTION C — (3 × 10 = 30 marks)**

**Answer any *THREE* questions.**

1. **Solve the following linear programming problem by simplex method.**

**Minimize *z = 16x1+16x2***

**Subject to *2x1+4x2≥3***

 ***3x1+2x2≥4***

 ***x1,x2≥0***

1. **Solve the following transportation problem.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **aj** |
| **F1** | **10** | **9** | **8** | **8** |
| **F2** | **10** | **7** | **10** | **7** |
| **F3** | **11** | **9** | **7** | **9** |
| **F4** | **12** | **14** | **10** | **4** |
| **bj** | **10** | **10** | **8** |  |

1. **Find the sequence that minimises the total time in hours required to complete the following jobs on three machines.**

**Job: 1 2 3 4 5 6 7**

**Machine I: 4 9 8 5 10 9 8**

**Machine II: 5 4 3 6 2 5 4**

**Machine III: 7 8 6 12 6 7 13**

**What is the minimum elapsed time.**

1. **The activities of a project have the following PERT time estimates.**

|  |  |  |  |
| --- | --- | --- | --- |
| **job** | **Optimistic time** | **Most likely time** | **Pessimistic time** |
| **1-2** | **3** | **6** | **15** |
| **7-8** | **4** | **19** | **28** |
| **2-3** | **6** | **12** | **30** |
| **3-5** | **5** | **11** | **17** |
| **5-8** | **1** | **4** | **7** |
| **6-7** | **3** | **9** | **27** |
| **4-5** | **3** | **6** | **15** |
| **2-4** | **2** | **5** | **8** |
| **1-6** | **2** | **5** | **14** |

1. **Draw the network diagram and determine the critical path.**
2. **Find the project completion time and its variance.**
3. **Following table gives the running costs per year and resale price of a certain equipment whose purchase price Rs. 5000.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| **Running Cost (Rs.)** | **1500** | **1600** | **1800** | **2100** | **2500** | **2900** | **3400** | **4000** |
| **Resale value (Rs.)** | **3500** | **2500** | **1700** | **1200** | **800** | **500** | **500** | **500** |

 **At what year is the replacement due?**

**———————**