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

**III YEAR — VI SEMESTER**

**ELECTIVE PAPER III — OPERATIONS RESEARCH**

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

**SECTION A — (10 × 2 = 20 marks)**

**Answer any *TEN* questions.**

1. What is the scope of Operations Research?
2. Write any two limitations of Operations Research?
3. Write the Mathematical formulation of Linear programming Problem.
4. Define feasible solution.
5. Express the following LPP in standard form

Minimize $Z=5x\_{1}+7x\_{2}$

 Subject to the Constraint $x\_{1}+x\_{2}\leq 8$

 $3x\_{1}+4x\_{2}\geq 3$

 $6x\_{1}+7x\_{2}\geq 5 and x\_{1},x\_{2}\geq 0$

1. Distinguish between transportation model and assignment model.
2. Define an unbalanced assignment problem
3. Define total elapsed time and idle time on machines.
4. Explain the sequencing problem of *n* jobs of *m* machines.
5. Distinguish between PERT and CPM.
6. What are the three main phases of a project?
7. Write the rules for constructing a project network.

**SECTION B — (5 × 5 = 25 marks)**

**Answer any *FIVE* questions.**

1. Solve the following L.P.P. graphically.

Maximize Z = 100 $x\_{1}+40x\_{2}$

 Subject to $ 5x\_{1}+2x\_{2}\leq 1000$

$$ 3x\_{1}+2x\_{2}\leq 900$$

$$ x\_{1}+2x\_{2}\leq 500$$

 and $x\_{1},x\_{2}\geq 0.$

14. Use simplex method to solve the LPP

 Maximize Z = 4 $x\_{1}+10x\_{2}$

 Subject to $2x\_{1}+x\_{2}\leq 50$

 $2x\_{1}+5x\_{2}\leq 100$

 $2x\_{1}+3x\_{2}\leq 90 and x\_{1}, x\_{2 }\geq 0 $

15. Use two phase simplex method to

 Maximize Z = $5x\_{1}+3x\_{2}$

 Subject to $2x\_{1}+x\_{2}\leq 1$

 $x\_{1}+4x\_{2}\geq 6$

 $x\_{1},x\_{2}\geq 0$.

1. Assign four trucks 1,2,3 and 4 to vacant spaces *A,B,C,D,E* and *F* so that the distance travelled is minimized. The matrix below shows the distance.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 |
| A | 4 | 7 | 3 | 7 |
| B | 8 | 2 | 5 | 5 |
| C | 4 | 9 | 6 | 9 |
| D | 7 | 5 | 4 | 8 |
| E | 6 | 3 | 5 | 4 |
| F | 6 | 8 | 7 | 3[P.T.O.] |

1. Find the sequence that minimizes the total elapsed time required to complete the following tasks on machines *M1*$,$, and *M2*$2i$*i*n the order M1, *M2 .* Also, find the minimum total elapsed time.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task | A | B | C | D | E | F | G | H | I |
| M1 | 2 | 5 | 4 | 9 | 6 | 8 | 7 | 5 | 4 |
| M2 | 6 | 8 | 7 | 4 | 3 | 9 | 3 | 8 | 11 |

1. Construct the network for the project whose activities and their relationships are as given below:

 Activities : A,D,E can start simultaneously.

 Activities : B,C >A ; G,F >D,C ; H> E, F.

1. Solve the following sequencing problem of 4 jobs on 6 machines

 (Processing time hrs) Machines:

|  |  |
| --- | --- |
|  | Machines |
| Job | M1 | M2 | M3 | M4 | M5 | M6 |
| A | 19 | 8 | 8 | 3 | 11 | 24 |
| B | 18 | 6 | 9 | 6 | 9 | 18 |
| C | 12 | 5 | 8 | 5 | 7 | 15 |
| D | 20 | 5 | 3 | 4 | 8 | 11 |

**SECTION C — (3× 10 = 30 marks)**

**Answer any *THREE* questions.**

1. A Pineapple firm produces two products canned pineapple and canned juice. The specific amounts of material, labour and equipment required to produce each product and the availability of each of these resources are shown in the table given below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Canned Juice | Canned pineapple | Available resources |
| Labour (Man hours) | 3 | 2.0 | 12.0 |
| Equipment (M/c hours) | 1 | 2.3 | 6.9 |
| Material (Unit) | 1 | 1.4 | 4.9 |

 Assuming one unit of canned juice and canned pineapple has profit margins ` 2 and ` 1 respectively. Formulate this as a L.P.P. and solve it graphically also.

1. Use Big – M method to solve

Maximize Z = $4x\_{1}+3x\_{2}$

 Subject to $2x\_{1}+x\_{2}\geq 10$.

 $-3x\_{1}+2x\_{2}\geq 6$.

 $x\_{1},x\_{2}\geq 0$

1. Solve the transportation problem with unit transportation costs, demands and supplies as given below:

|  |  |
| --- | --- |
|  | Destination |
| **Source** |  | D1 | D2 | D3 | D4 | Supply |
| S1 | 6 | 1 | 9 | 3 | 70 |
| S2 | 11 | 5 | 2 | 8 | 55 |
| S3 | 10 | 12 | 4 | 7 | 70 |
| Demand | 85 | 35 | 50 | 45 |  |

1. Compute the minimum total elapsed time needed to process Jobs 1 and 2 on five machines M1, M2, M3, M4 and M5 given the following data:

 Job 1 Sequence M1 M2 M3 M4 M5

 Time (hrs) 2 3 4 6 2

 Job 2 Sequence M3 M1 M4 M5 M2

 Time (hrs) 4 5 3 2 6

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

|  |  |  |  |
| --- | --- | --- | --- |
| 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. Draw the network
2. What is the probability that the project will be completed in 27 days ?

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