

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2021

B.Tech VII Semester

COURSE CODE: 19B1WEC733

MAX. MARKS: 35

COURSE NAME: Optimization Techniques

COURSE CREDITS: 3

MAX. TIME: 2 Hours

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. A company has received a contract to supply gravel to three new construction projects located in town A, B and C. The company has 3 gravel pits in town X, Y and Z. The company has estimated the delivery cost (in Rs) from each pit to project site. Find the initial transportation cost using North West Corner and Least cost Method. Also calculate optimized minimum cost after getting initial solution from Vogel's approximation method. [6]

| | A | B | C | Supply |
|--------|----|-----|----|--------|
| X | 4 | 8 | 8 | 76 |
| Y | 16 | 24 | 16 | 82 |
| Z | 8 | 16 | 24 | 77 |
| Demand | 72 | 102 | 41 | |

2. A company has four machines that are to be used for three jobs. Each job can be assigned to one and only one machine. The cost of each job on each machine is given in the following table. Find the job assignment pairs that cost minimum. What kind of problem it is and state reason whether it can have multiple solution or not. If yes find it. [5]

| | W | X | Y | Z |
|---|----|----|----|----|
| A | 18 | 24 | 28 | 32 |
| B | 8 | 13 | 17 | 18 |
| C | 10 | 15 | 19 | 22 |

3. Write the dual of the following LP Problem, Minimize $Z = 3x_1 - 2x_2 + 4x_3$ subject to constraints $3x_1 + 3x_2 + 4x_3 \geq 5$, $7x_1 + x_2 + 4x_3 \geq 4$, $7x_1 - 2x_2 - 2x_3 \leq 9$, $x_1 - 2x_2 + 7x_3 \geq 3$, $4x_1 + 7x_2 - 2x_3 \geq 2$ and $x_1, x_2, x_3 \geq 0$. [3]

4. According to the following table shown below, draw the network diagram; calculate the critical path, total float, free float and independent floats. [6]

| Activity | Predecessor | Optimistic Time |
|----------|-------------|-----------------|
| A | - | 5 |
| B | A | 7 |
| C | B | 2 |
| D | B | 3 |
| E | C | 1 |
| F | D | 2 |
| G | C | 1 |
| H | E,F | 3 |
| I | G,H | 10 |

5. According to the following table shown below, draw the network diagram. Calculate the critical path and expected time of completion. Determine the probability of project completion in 55 days. [6]

| Activity | Predecessor | Optimistic Time | Most Likely Time | Pessimistic |
|----------|-------------|-----------------|------------------|-------------|
| A | - | 4 | 6 | 8 |
| B | A | 5 | 7 | 15 |
| C | A | 4 | 8 | 12 |
| D | B | 15 | 20 | 25 |
| E | B | 10 | 18 | 26 |
| F | C | 8 | 9 | 16 |
| G | E | 4 | 8 | 12 |
| H | D,F | 1 | 2 | 3 |
| I | G,H | 6 | 7 | 8 |

| Z-Value(Normal Distribution) | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|------------------------------|--------|--------|--------|--------|--------|
| 2.1 | 0.4842 | 0.4846 | 0.4850 | 0.4854 | 0.4857 |
| 2.2 | 0.4878 | 0.4881 | 0.4884 | 0.4887 | 0.4890 |

6. Use Big-M Method to solve the following LPP, Minimize $Z = 5x_1 + 3x_2$ subject to constraint $2x_1 + 4x_2 \leq 12$, $2x_1 + 2x_2 = 10$, $5x_1 + 2x_2 \geq 10$ and $x_1, x_2 \geq 0$ [5]
7. For a maximization problem $Z = 50x_1 + 30x_2$ under the constraint such that $2x_1 + x_2 \geq 18$, $x_1 + x_2 \geq 12$ and $x_1, x_2 \geq 0$. solve the problem graphically. [4]