



Kalinga Institute of Industrial Technology

School of Computer Applications Practice Questions Optimization Techniques (MS-4108)

Q.1) Use graphical method to solve the LPP.

$$\begin{aligned}\text{Maximize } Z &= 5x_1 + 7x_2 \\ \text{subject to } &x_1 + x_2 \leq 4 \\ &3x_1 + 8x_2 \leq 24 \\ &10x_1 + 7x_2 \leq 35 \\ &x_1 \geq 0, x_2 \geq 0\end{aligned}$$

Q.2) Use graphical method to solve the LPP.

$$\begin{aligned}\text{Maximize } Z &= 3x_1 + 4x_2 \\ \text{subject to } &5x_1 + 4x_2 \leq 200 \\ &3x_1 + 5x_2 \leq 150 \\ &5x_1 + 4x_2 \geq 100 \\ &8x_1 + 4x_2 \geq 80 \\ &x_1 \geq 0, x_2 \geq 0\end{aligned}$$

Q.3) Solve the linear programming problem using simplex method.

$$\begin{aligned}\text{Maximize } Z &= 6x_1 + 7x_2 \\ \text{subject to } &7x_1 + 6x_2 \leq 42 \\ &5x_1 + 9x_2 \leq 45 \\ &x_1 - x_2 \leq 4 \\ &x_1 \geq 0, x_2 \geq 0\end{aligned}$$

Q.4) Write the dual of the following linear programming problem:

$$\begin{aligned}\text{Maximize } Z &= 50x_1 + 100x_2 \\ \text{subject to } &2x_1 + x_2 \leq 1250 \\ &2x_1 + 5x_2 \leq 1000 \\ &2x_1 + 3x_2 \leq 900 \\ &x_2 \leq 150 \\ \text{where } &x_1 \geq 0, x_2 \geq 0\end{aligned}$$

Q.5) Express the dual of the following LP problem:

$$\text{Maximize } Z = 2x_1 + x_2$$

$$\begin{aligned}
\text{subject to } & x_1 - 2x_2 \geq 2 \\
& x_1 + 2x_2 = 8 \\
& x_1 - x_2 \leq 11 \\
& x_1 \geq 0, \ x_2 \text{ is unrestricted in sign}
\end{aligned}$$

Q.6) Determine an initial basic feasible solution to the following transportation problem by using (a) NWCR, (b) LCM and (c) VAM.

| | D1 | D2 | D3 | D4 | Supply |
|--------|----|----|----|----|--------|
| S1 | 21 | 16 | 15 | 3 | 11 |
| S2 | 17 | 18 | 14 | 23 | 13 |
| S3 | 32 | 27 | 18 | 41 | 19 |
| Demand | 6 | 6 | 8 | 2 | |

Q.7) A department of a company has five employees with five jobs to be performed. The time (in hours) that each man takes to perform each job is given in the effectiveness matrix.

| | E_1 | E_2 | E_3 | E_4 | E_5 |
|-----|-------|-------|-------|-------|-------|
| A | 10 | 5 | 13 | 15 | 16 |
| B | 3 | 9 | 18 | 13 | 6 |
| C | 10 | 7 | 2 | 2 | 2 |
| D | 7 | 11 | 9 | 7 | 12 |
| E | 7 | 9 | 10 | 4 | 12 |

How should the jobs be allocated, one per employee, so as to minimize the total man-hours?

Q.8) A travelling salesman has to visit five cities. He wishes to start from a particular city, visit each city once and then return to his starting point. The travelling cost (in '000 Rs) of each city from a particular city is given below:

| | A | B | C | D | E |
|-----|----------|----------|----------|----------|----------|
| A | ∞ | 2 | 5 | 7 | 1 |
| B | 6 | ∞ | 3 | 8 | 2 |
| C | 8 | 7 | ∞ | 4 | 7 |
| D | 12 | 4 | 6 | ∞ | 5 |
| E | 1 | 3 | 2 | 8 | ∞ |

What should be the sequence of visit of the salesman so that the cost is minimum?