

14MA3015 Operations Research Techniques

Set
A

Time : 3 hrs
Total Marks: 100

1. Using Simplex method solve (20 Marks)

$$\text{Minimize } Z = 3x_1 + 2x_2 + 5x_3$$

Subject to

$$x_1 + 4x_2 \leq 420$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 2x_2 + x_3 \leq 430$$

$$\text{and } x_1, x_2, x_3 \geq 0.$$

OR

2. Solve by two phase simplex method (20 marks)

$$\text{Max } z = 5x_1 + 8x_2$$

$$\text{s.t. } 3x_1 + 2x_2 \geq 3$$

$$x_1 + 4x_2 \geq 4$$

$$x_1 + x_2 \leq 5$$

$$\text{and } x_1, x_2 \geq 0$$

3. Solve the transportation problem (20 Marks)

| | D1 | D2 | D3 | D4 | a_i |
|--------|----|-----|-----|-----|-------|
| O1 | 90 | 90 | 100 | 110 | 200 |
| 100O52 | 50 | 70 | 130 | 85 | |
| O3 | 0 | 0 | 0 | 0 | |
| r_j | 75 | 100 | 100 | 30 | |

OR

4. Find the optimum sequence and total elapsed time (20 Marks)

| | M1 | M2 | M3 | M4 | M5 |
|----|----|----|----|----|----|
| J1 | 7 | 5 | 2 | 3 | 9 |
| J2 | 6 | 6 | 4 | 5 | 10 |
| J3 | 5 | 4 | 5 | 6 | 8 |
| J4 | 8 | 3 | 3 | 2 | 6 |

5. Find the minimum Assignment (20 marks)

| | | | | | |
|----|----|----|----|----|----|
| 31 | 62 | 29 | 42 | 15 | 41 |
| 12 | 19 | 39 | 55 | 72 | 40 |
| 17 | 29 | 50 | 41 | 22 | 22 |
| 35 | 14 | 38 | 42 | 27 | 33 |
| 19 | 30 | 29 | 16 | 22 | 23 |
| 72 | 30 | 30 | 50 | 41 | 20 |

OR

6. Using graphical method solve (20 Marks)

| | | | | | | |
|-------|----------|---|---|---|---|---|
| JOB 1 | Sequence | A | B | C | D | E |
| | Time | 3 | 4 | 5 | 7 | 3 |
| JOB 2 | Sequence | C | A | D | E | B |
| | Time | 5 | 6 | 4 | 3 | 7 |

7. a) Cans from coke production line follow the following distribution regarding the weights. Simulate the process and find what percentage of cans is at or above 12 oz in weight. (10 Marks)

| Weight | Percentage |
|--------|------------|
| 11.8 | 10 |
| 11.9 | 20 |
| 12 | 40 |
| 12.1 | 20 |
| 12.2 | 10 |

- b) The job involved in a small project listed below. The duration is given in terms of weeks. Compute the critical path, total duration, ES, EF, LS, LT, TS, FS (10 Marks)

| JOB | 1-2 | 1-3 | 1-4 | 2-6 | 3-7 | 4-5 | 5-6 | 5-7 | 5-8 | 6-8 | 8-9 | 7-9 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| DURATION | 4 | 6 | 8 | 8 | 12 | 10 | 0 | 0 | 4 | 9 | 5 | 8 |

OR

8. a) Customers arrive at a window drive in a bank according to Poisson distribution with mean 10/hr. Service time per customer is exponential with mean 5 mins. Calculate P_0, L_s, L_q, W_s, W_q (10 marks)
 b) A project is represented by the networks and has the following data. Calculate Critical path, $T_e, t_e, V_t, S_t, ES, EF, LS, LF, TF, FF$ (10 Marks)

| task | 1-2 | 1-3 | 2-5 | 3-4 | 4-5 | 5-8 | 4-6 | 4-7 | 6-9 | 8-9 | 7-10 | 9-10 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| t_0 | 3 | 1 | 6 | 8 | 0 | 5 | 6 | 3 | 1 | 3 | 8 | 2 |
| t_m | 5 | 2 | 8 | 12 | 0 | 7 | 9 | 6 | 2 | 6 | 15 | 4 |
| t_p | 7 | 3 | 12 | 17 | 0 | 9 | 12 | 8 | 3 | 8 | 20 | 6 |

9. Using Dual Simplex method Solve (20 marks)

$$\text{Maximize } Z = 2x_1 + 9x_2 + 24x_3 + 8x_4 + 5x_5$$

Subject to

$$x_1 + x_2 + 2x_3 - x_5 - x_6 = 1$$

$$-2x_1 + x_3 + x_4 + x_5 - x_7 = 2$$

and

$$x_1, x_2, x_3, x_4, x_5, x_6, x_7 \geq 0.$$

Wishing you All the Best