Nirma University

Institute of Technology

Semester End Examination (IR), December - 2021

B. Tech. in CSE / EC Engineering, Semester-VII

2MAOE26 Operations Research

Roll No. [ ] Supervisor's initials with date: [ ]

Time: 2 hours Max. Marks: 50

Instructions: 1. Attempt all questions.

2. Figures to right indicate full marks.

Q:1 CO1, L3, L4, L6

A company makes two types of leather belts. Belt A is a high quality belt and belt B is of lower quality. The respective profits are Rs 4 Rs 3 per belt. Each of type A requires twice as much time as a belt of type B, and if all belts were of type B, the company could make 1000 per day. The supply of leather is sufficient for only 800 belts per day (both A and B combined). Belt A requires a fancy buckle and only 400 per days are available. There are only 700 buckles a day available for belt B. **[14]**

What should be the daily production of each type of belt? Formulate the linear programming problem and solve it by simplex method.

OR

Q:1 CO1, L3, L5

Use Two-phase simplex method to solve the following LP problem. **[14]**

Minimize $Z = x_1 - 2x_2 - 3x_3$

Subject to constraints: $-2x_1 + x_2 + 3x_3 = 2$

$2x_1 + 3x_2 + 4x_3 = 1$ and $x_1, x_2, x_3 \geq 0$

Q:2

[A] CO1, L3,L5

Solve graphically the following NLP problem **[04]**

Maximize $Z = 8x_1 - x_1^2 + 8x_2 - x_2^2$

Subject to constraints: $x_1 + x_2 \leq 12$

$x_1 - x_2 \geq 4$ and $x_1, x_2 \geq 0$

[B] A manufacturer has distribution centers located at Agra, Allahabad and Calcutta. These centers have available 8, 4 and 8 units of his product. His retail outlets require 5, 2, 4, 6 and 3 units respectively. The shipping cost per unit (in rupees) between each center and outlet is given in the following table. **[10]**

CO2, CO3, L4,L6

Distribution center	A	B	C	D	E
Agra	55	30	40	50	40
Allahabad	35	30	100	45	60
Calcutta	40	60	95	35	30

Determine the optimal shipping cost.

Q:3 An airline company has drawn up a new flight schedule involving five flights. To assist in allocating five pilots to the flights, it has asked them to state their preference scores by giving each flight a number out of 10. The higher the number, the greater is the preference. Certain of these flights are unsuitable to some pilots owing to domestic reasons. These have been marked with a X. **[10]**

CO2, CO3, L4,L6

		Flight Number				
		A	B	C	D	E
Pilot	P1	8	2	X	5	4
	P2	10	9	2	8	4
	P3	5	4	9	6	X
	P4	3	6	2	8	7
	P5	5	6	10	4	3

What should be the allocation of the pilots to flights in order to meet as many preferences as possible?

Q:4 The owner of a chain of fast food restaurants, is considering a new computer system for accounting and inventory control. A computer company send the following information about the computer system installation. **[12]**

CO4, L4,L5, L6

Activity		A	B	C	D	E	F	G	H	I
Predecessors		-	A	A	B	B	C	E	D,F	G,J
Time (Days)	O	4	5	4	15	10	8	4	1	6
	M	6	7	8	20	18	9	8	2	7
	P	8	15	12	25	26	16	12	3	8

(1) Construct an arrow diagram of the project.
(2) Determine the critical path and compute the expected completion time.
(3) Determine the probability of completing the project in 55 days.
