STATISTICS
COURSE- STSHDSE-2
(OPERATIONS RESEARCH)

Time: 1.30 Hours   *Full Marks 30*

(Symbols and notations have their usual meanings)

1. **Answer any six questions:**   **6 X 5 = 30**

    1. Formulate the problem mathematically:
       A patient needs daily 5mg, 20mg and 15mg of vitamins A, B and C respectively. The vitamins available from a mango, an orange and an apple, are 0.5 mg of A, 1 mg of b, 1 mg of C; 2 mg of b, 3 mg of C; 0.5 mg of A, 3 mg of B and 1 mg of C respectively. If the cost of a mango, an orange and an apple be Rs. 0.50, Rs. 0.25 and Rs. 0.40 respectively, find the minimum cost of collecting the fruits so that daily requirement of the patient be met.

    2. (i) Transform the following constraints into equations by using slack or surplus variables.
       $$x_1 + 2x_2 - 3x_3 \geq 2$$
       $$x_1 + x_2 + 4x_3 \leq 16$$
       $$x_1 + x_2 - x_3 = 4, x_1 \geq 0, x_2 \geq 0, x_3 \geq 0.$$

       (ii) Transform the following L.P.P. into the form where all constraints are of equality type
       $$x_1 - x_2 - x_3 \geq 16$$
       $$2x_1 + x_2 + x_3 \geq 18, x_1 \geq 0, x_2 \geq 0, x_3 \geq 0.$$

    3. Solve graphically the L.P.P.
       Maximize, $z = 2x_1 + x_2$, subject to
       $$x_1 + x_2 \leq 2$$
       $$-x_1 + x_2 \leq 1$$
       $$x_1 \leq 2, x_1 \geq 0, x_2 \geq 0.$$

    4. Solve graphically the L.P.P.
       Minimize, $z = 4x_1 + 5x_2$, subject to
       $$x_1 + 2x_2 \geq 2$$
       $$5x_1 + 3x_2 \leq 15, \qquad x_1 \geq 0, x_2 \geq 0.$$

    5. Determine an initial B.F.S. of the following problems by the method of North-West Corner Rule.

	A	B	C	D	a_i
O	4	6	9	5	16
P	2	6	4	1	12
R	5	7	2	9	15
b	12	14	9	8	43

    6. Determine an initial B.F.S. to the following balanced T.P. using matrix minimum method

	A	B	C	D	a
O	5	3	6	2	19
P	4	7	9	1	37
R	3	4	7	5	34
	16	18	31	25	90

7. Determine an initial B.F.S. to the following balanced T.P. using north-west corner method

	A	B	C	D	a
O	9	8	5	7	12
P	4	6	8	7	14
R	5	8	9	5	16
b	8	18	13	3	

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