MAT/MAS 3444   **Time: 3hrs**

Operations Research   **Max: 75marks**

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Answer any FIVE questions: **5x15=75**

1. (a) <u>Solve by graphical method</u>: Find the minimum value of $Z = 7y_1 + 8y_2$ subject to the constraints: $3y_1 + y_2 \geq 8$, $y_1 + 3y_2 \geq 11$; $y_1, y_2 \geq 0$.
   (b) Use Simplex method to Maximize $Z = 5x_1 + 3x_2$ subject to the constraints:
   $x_1 + x_2 \leq 2$, $5x_1 + 2x_2 \leq 10$, $3x_1 + 8x_2 \leq 12$; $x_1, x_2 \geq 0$.

2. Solve the following linear programming problem by dual simplex method:
   Minimize $Z = 2x_1 + 9x_2 + 24x_3 + 8x_4 + 5x_5$ subject to the constraints:
   $x_1 + x_2 + 2x_3 - x_5 - x_6 = 1$, $-2x_1 + x_3 + x_4 + x_5 - x_7 = 2$, $x_j \geq 0$; j =1, 2...7.

3. The head of the department has five jobs A, B, C, D, E and five sub-ordinates V, W, X, Y and Z. The number of hours each man would take to perform each job is as follows:

	V	W	X	Y	Z
A	3	5	10	15	8
B	4	7	15	18	8
C	8	12	20	20	12
D	5	5	8	10	6
E	10	10	15	25	10

   How should the jobs be allocated to minimize the total time?

4. Use two-phase simplex method to Maximize $Z = 5x_1 + 8x_2$ subject to the constraints:
   $3x_1 + 2x_2 \geq 3$, $x_1 + 4x_2 \geq 4$, $x_1 + x_2 \leq 5$; $x_1, x_2 \geq 0$.

5. Use Revised simplex method to solve the following L.P.P., Maximize $Z = 3x_1 + 2x_2 + 5x_3$ subject to the constraints: $x_1 + 2x_2 + x_3 \leq 430$, $3x_1 + 2x_3 \leq 460$, $x_1 + 4x_2 \leq 420$; $x_1, x_2, x_3 \geq 0$

6. Solve the following transportation problem:

   Destination

	1	2	3	4	
1	21	16	25	13	11
2	17	18	14	23	13
3	32	27	18	41	19
	6	10	12	15	

   Source (rows 1, 2, 3)   Availability (11, 13, 19)

7. Solve the following game:

	Player B					
Player A	I	II	III	IV	V	VI
1	4	2	0	2	1	1
2	4	3	1	3	2	2
3	4	3	7	−5	1	2
4	4	3	4	−1	2	2
5	4	3	3	−2	2	2

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