11. What is duality? What is the significance of dual variables in Simplex solution? **(6)**

12. What is simulation? Describe the simulation process. **(6)**

Section- C

13. Use the two phase simplex method to- **(7+8)**

Max. Z= $5x_1 - 4x_2 + 3x_3$

Subject to $2x_1 + x_2 - 6x_3 = 20,$

$6x_1 + 5x_2 + 10x_3 \leq 76,$

$8x_1 - 3x_2 + 6x_3 \leq 50,$

$x_1, x_2, x_3 \geq 0$

14. A company has three plants at locations A, B and C which supply ware houses located at D, E, F, G and H. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirement are 400, 350, 300, 250 and 900. The unit transportation costs in rupees are given below: **(8+7)**

	D	E	F	G	H
A	8	8	9	4	3
B	5	8	5	11	6
C	8	9	7	3	3

Determine an optimum distribution for the company in order to minimize the total transportation cost. How much is the cost?

Roll No.....

BCA-404(O)

B.C.A. (Semester-IV) Examination-2014

Paper: Fourth

Operation Research

Time: Three Hours] [Maximum Marks: 75

Section-A

1. Define operation research. Give features of OR. Briefly discuss techniques and tools of OR. **(7)**

2. Find the maximum value of **(6)**

$Z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \leq 30,$

$x_2 \geq 3,$

$x_2 \leq 12,$

$x_1 - x_2 \geq 0$

$0 \leq x_1 \leq 20$

By Graphical method.

3. What are the advantages of linear programming approach? State the limitations of LP. **(5)**

Section-B

4. A firm produces an alloy having the following specifications: **(6)**

(i) Specific gravity ≤ 0.98

(ii) Chromium $\geq 8\%$.

(iii) Melting point $\geq 450^0C$.

Raw materials A, B and C having the properties shown in the table can be used to make the alloy.

Property	Properties of Raw materials		
	A	B	C
Specific Gravity	0.92	0.97	1.04
Chromium	7%	13%	16%
Melting Point	440^0C	490^0C	480^0C

Costs of various raw materials per ton are: ₹90 for A, ₹280 for B and ₹40 for C. Formulate the L.P. model to minimize the cost of raw materials.

5. Define the following: **(6)**

(i) Basic Solution

(ii) Basic feasible solution

(iii) Degenerate Solution

6. Find all the basic feasible solutions of the equations- **(6)**

$$2x_1 + 6x_2 + 2x_3 + x_4 = 3$$
$$6x_1 + 4x_2 + 4x_3 + 6x_4 = 2$$

7. Solve the Simplex method- **(6)**

Max. Z= $12x_1 + 15x_2 + 14x_3$,

Subject to $-x_1 + x_2 \leq 0$,

$-x_2 + 2x_3 \leq 0$

$x_1 + x_2 + x_3 \leq 100$

where $x_1, x_2, x_3 \geq 0$

8. Give the mathematical formulation of an assignment problem. **(6)**

9. Solve the following Assignment problem: **(6)**

		Operators				
		I	II	III	IV	V
Machines	A	10	5	13	15	16
	B	3	9	18	3	6
	C	10	7	2	2	2
	D	5	11	9	7	12
	E	7	9	10	4	12

10. What is degeneracy in transportation problems? How is it resolved? **(6)**