## Total number of printed pages - 3

B. Tech

**HSSM 3302** 

CENTRAL !

## Sixth Semester Back Examination – 2015 OPTIMIZATION IN ENGINEERING

**BRANCH: MECH** 

**QUESTION CODE: M 124** 

Full Marks - 70

Time: 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.

The figures in the right-hand margin indicate marks.

Answer the following questions :

2×10

- (a) Define slack and surplus variable.
- (b) Obtain the dual problem of the following primal LP problem

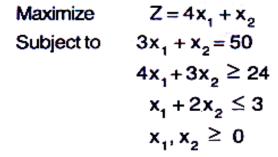
Maximize 
$$Z = 8x_1 + x_2$$
  
subject to  $x_1 + 2x_2 + 4x_3 \ge 2$   
 $x_1 + 2x_2 + 4x_3 = 1$   
and  $x_1, x_2 \ge 0$ 

- (c) What is pivot element?
- (d) Why do you perform a sensitivity analysis?
- (e) What do you mean by unbalanced assignment problem? How do you handle such situation in order to find a solution?
- (f) Explain Markovian Queuing model.
- (g) What are different types of queuing discipline?
- (h) What are the primary uses of Kuhn-Tucker necessary and sufficient conditions?
- Define linear, non-linear functions with examples.
- (j) What is quadratic programming? Give one example.

(a) Solve the following LPP using graphical method: 2.

Maximize 
$$Z = 3x_1 + 5x_2$$
  
Subject to  $3x_1 + 2x_2 \le 20$   
 $x_1 + 3x_2 \le 8$   
 $2x_1 - 4x_2 \le 5$   
 $x_2 \le 2$   
 $x_1, x_2 \ge 20$ 

Solve the following LPP using Big-M method: (b)



Using duality, solve the following LPP: 3. (a)

Minimize 
$$Z = 4x_1 + 2x_2 + 3x_3$$
  
subject to  $2x_1 + 4x_3 \ge 5$ ,  
 $2x_1 + 3x_2 + x_3 \ge 4$   
 $x_1, x_2, x_3 \ge 0$ 

Using dual Simplex method, solve the following LPP: (b)

Maximize 
$$Z = 5x_1 + 6x_2$$
,  
subject to  $x_1 + x_2 \ge 2$   
 $4x_1 + x_2 \ge 4$   
 $x_1, x_2 \ge 0$ 

Using revised simplex method to solve the following LPP: 4.

Maximize 
$$Z = x_1 + 2x_2 + 3x_3 - x_4$$
  
subject to  $x_1 + 2x_2 + 3x_3 = 15$   
 $2x_1 + x_2 + 5x_3 = 20$   
 $x_1 + 2x_2 + x_3 + x_4 = 10$   
 $x_1, x_2, x_3, x_4 \ge 0$ 

 (a) Solve the following Transportation problem to minimize the transportation cost:

Source/Destination	Α	В	С	D	Supply
1	19	30	50	10	7
2	70	30	40	60	9
3	40	8	70	20	18
Demand	5	8	7	14	

(b) Four machines are available to assign four jobs. Find the assignment of machines to the job that will result in maximum profit.

Machines/jobs	Α	В	С	D
1	1	4	6	3
2	9	7	10	9
3	4	5	11	7
4	8	7	8	5

 Explain the general search technique. Solve the following problem using Golden search method in 5 iterations.

Minimize  $Z = 2x^2 + 33/x$  in the interval (0, 5)

7. Minimize  $Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$ 

Subject to  $x_1 + x_2 + x_3 = 1.5$ 

$$2x_1 - x_2 + 2x_3 = 20$$

$$x_1, x_2 \ge 0$$

using Lagrange method.

8. Solve the following Quadratic programming using Wolfe's method: 10

Maximize 
$$Z = 2x + y - x^2$$

Subject to 
$$2x + 3y \le 6$$

$$2x + y \le 4$$

$$x, y \ge 0$$

10