Registration No. : | | | | | | | | | | |

Total number of printed pages – 3

B. Tech

HSSM 3302

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.

1. 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 $x_1 + 2x_2 + 4x_3 \geq 2$

$x_1 + 2x_2 + 4x_3 = 1$

and $x_1, x_2 \geq 0$

(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 ?

(i) Define linear, non-linear functions with examples.

(j) What is quadratic programming ? Give one example.

P.T.O.

2. (a) Solve the following LPP using graphical method : 4

Maximize $Z = 3x_1 + 5x_2$

Subject to $3x_1 + 2x_2 \leq 20$

$x_1 + 3x_2 \leq 8$

$2x_1 - 4x_2 \leq 5$

$x_2 \leq 2$

$x_1, x_2 \geq 20$

(b) Solve the following LPP using Big-M method : 6

Maximize $Z = 4x_1 + x_2$

Subject to $3x_1 + x_2 = 50$

$4x_1 + 3x_2 \geq 24$

$x_1 + 2x_2 \leq 3$

$x_1, x_2 \geq 0$

3. (a) Using duality, solve the following LPP : 5

Minimize $Z = 4x_1 + 2x_2 + 3x_3$

subject to $2x_1 + 4x_3 \geq 5,$

$2x_1 + 3x_2 + x_3 \geq 4$

$x_1, x_2, x_3 \geq 0$

(b) Using dual Simplex method, solve the following LPP : 5

Maximize $Z = 5x_1 + 6x_2,$

subject to $x_1 + x_2 \geq 2$

$4x_1 + x_2 \geq 4$

$x_1, x_2 \geq 0$

4. Using revised simplex method to solve the following LPP : 10

Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$

subject to $x_1 + 2x_2 + 3x_3 = 15$

$2x_1 + x_2 + 5x_3 = 20$

$x_1 + 2x_2 + x_3 + x_4 = 10$

$x_1, x_2, x_3, x_4 \geq 0$

5. (a) Solve the following Transportation problem to minimize the transportation cost : 5

Source/Destination	A	B	C	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. 5

Machines/jobs	A	B	C	D
1	1	4	6	3
2	9	7	10	9
3	4	5	11	7
4	8	7	8	5

6. Explain the general search technique. Solve the following problem using Golden search method in 5 iterations. 10

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 $x_1 + x_2 + x_3 = 15$

$2x_1 - x_2 + 2x_3 = 20$

$x_1, x_2 \geq 0$

using Lagrange method. 10

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

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

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

$2x + y \leq 4$

$x, y \geq 0$