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

*Total number of printed pages – 3*

B. Tech

HSSM 3302

## Fifth Semester Regular Examination – 2014

## OPTIMIZATION IN ENGINEERING

## BRANCH(S) : CSE, EEE, ELECTRICAL, ENV, IT, MANUFACT, MANUTECH, MINERAL, MM, MME

**QUESTION CODE : H 174**

**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 artificial variable.

(b) What is sensitivity analysis and why do we perform it ?

(c) Explain briefly simplex method of solving a Linear programming problem. How is it better than graphical method ?

(d) Explain integer programming.

(e) Describe transportation problem with its general mathematical formulation.

(f) Show that assignment model is a special case of transportation model.

(g) Define a queue. Give a brief description of the type of queue discipline commonly faced.

(h) What is the meaning of a finite source population ?

(i) Define nonlinear function, convex set, non convex set.

(j) Define local minimum and global minimum of a function.

P.T.O.

2. (a) Solve the following LLP by graphical method : 4

Minimize $Z = 3x_1 + 2x_2$

subject to $2x_1 - x_2 \geq 2$

$x_1 + 2x_2 \leq 8$

$x_1, x_2 \geq 0$

(b) Use Big-M method to solve the following LPP : 6

Minimize $Z = 5x_1 + 6x_2$

subject to $2x_1 + 5x_2 \geq 1500$

$3x_1 + x_2 \geq 1200$

$x_1, x_2 \geq 0$

3. Find the dual of the following LPP and using dual simplex algorithm, solve : 10

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

subject to $2x_1 - x_2 + x_3 \geq 4$

$x_1 + x_2 + 2x_3 \geq 8$

$x_2 - x_3 \geq 2$

$x_1, x_2, x_3 \geq 0$

4. Find the optimum integer solution of the following integer programming problem : 10

Maximize $Z = 4x_1 + 3x_2$

subject to $x_1 + 2x_2 \leq 4$

$2x_1 + x_2 \leq 6$

$x_1, x_2 \geq 0$ and are integers.

5. (a) Solve the following Transportation problem to maximize the profit : 5

| Origin/Source | A | B | C | D | Capacity |
|---|---|---|---|---|---|
| 1 | 6 | 7 | 3 | 4 | 5 |
| 2 | 7 | 9 | 1 | 2 | 7 |
| 3 | 6 | 5 | 16 | 7 | 8 |
| 4 | 18 | 9 | 10 | 2 | 10 |
| Demand | 10 | 5 | 10 | 5 | |

(b) Solve the following assignment problem : 5

| Job/persons | A | B | C | D |
|---|---|---|---|---|
| 1 | 10 | 12 | 19 | 11 |
| 2 | 5 | 10 | 7 | 8 |
| 3 | 12 | 14 | 13 | 11 |
| 4 | 8 | 15 | 11 | 9 |

6. Solve the following problem using only the Kuhn-Tucker conditions : 10

Maximize $Z = 100 - 1.2\,x_1 - 1.5x_2 + 0.3\,x_1^2 + 0.05x_2^2$

subject to $x_1 + x_2 \geq 6$

$x_1, x_2 \geq 0$



7. (a) Use the Golden section search method to minimize the function : 6

Min $f(x) = 2(x-3)^2 + e^{0.5x^2}$, $0 \leq x \leq 100$.

(b) Explain Langrage's method to solve the non-linear programming. 4

8. Solve the following using projection gradient method : 10

Minimize : $f(x) = 25(x_1 - 3x_2)^2 + (x_1 - 3)^2$.