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

Total number of printed pages – 3

B. Tech

HSSM 3302

Fifth Semester Back Examination – 2014

OPTIMIZATION IN ENGINEERING

BRANCH(S) : EEE, ELECTRICAL, MINERAL

QUESTION CODE : L 305

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) What are the function of surplus and artificial variables in a LPP ?

(b) Comment on the solution of the following LPP

Maximize $z = 4x_1 + 2x_2$

Subject to $-x_1 + 2x_2 \leq 6$

$-x_1 + x_2 \leq 2$

$x_1, x_2 \geq 0$

(c) Obtain the dual problem of the following primal LP problem

Maximize $Z = x_1 + 3x_2$

Subject to $x_1 - 2x_2 \leq 5$

$2x_1 + 4x_2 \geq 2$

and $x_1, x_2 \geq 0$

(d) What is the principle of Big-M method in finding the solution of LPP ?

(e) What is the advantage of least cost rule over North-West corner rule to find the initial feasible solution of a transportation problem ?

(f) Do you agree that an assignment problem is a special case of transportation problem ? Explain.

P.T.O.

(g) Explain the concept of branch and bound method in integer programming.

(h) Explain why Fibonacci search method is called sequential search technique.

(i) What is quadratic programming ? Give one example of quadratic programming problem.

(j) Explain why Genetic algorithm is called a search technique.

2. (a) A manufacturer company produces two different types of products P1 and P2. Both these products are to be processed through two different machines M1 and M2. Machine M1 is available for 200 hours and machine M2 is available for 100 hours. The requirements of time on these machines is as follows :

	Product P1	Product P2
Machine M1	10 hours	6 hours
Machine M2	5 hours	4 hours

The company makes a profit of Rs800 on sale of one product P1 and Rs 500 on sale of the product P2. The company wants to know the quantities of products P1 and P2 to produce to maximize the profit. Formulate the problem into a LPP 4

(b) Using simplex method, solve the following LLP 6

Maximize $Z = 2x_1 + x_2 - 3x_3 + 5x_4$

Subject to $x_1 + 2x_2 - 3x_3 + 4x_4 \leq 40$

$2x_1 - x_2 + x_3 + 2x_4 \leq 8$

$4x_1 - 2x_2 + x_3 - x_4 \leq 10$

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

3. Find the optimum integer solution to the following LPP 10

Maximize $Z = x_1 + 4x_2$

Subject to $2x_1 + 4x_2 \leq 7$

$5x_1 + 3x_2 \leq 15$

$x_1, x_2 \geq 0$

4. Write the principle of obtaining dual from the primal. Convert the following primal to dual and solve 10

Maximize $Z = 3x_1 + 5x_2$

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

$x_1 + 3x_2 \leq 8$

$2x_1 - 4x_2 \leq 5$

$x_2 \leq 2$

$x_1, x_2 \geq 20$

5. (a) Write the steps involved in Revised simplex method to find the solution of a LPP. 5

(b) Arrival rate of telephone calls at a telephone booth are according to Poisson distribution with an average of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed with mean 3 minutes. 5

(i) Determine the probability that a person arriving at a booth will have to wait.

(ii) Find the average queue length that is formed from time to time.

(ii) Find the fraction of the day that the phone is in use.

6. Write the short notes of the followings : 3 + 3 + 4

(a) Non-linear programming

(b) Queue discipline

(c) Fibonacci search method

7. Minimize the following objective function using Golden section search method. Use a resolution of $\varepsilon = 0.10$ 10

Minimize $f(x) = 2(x-3)^2 + e^{0.5x}$

$0 \leq x \leq 100$

8. Solve the following problem using the projected gradient method 10

Minimize $Z = 25(x_1 - 3x_2)^2 + (x_1 - 3)^2$

Subject to $x_1 + 2x_2 = 9.$