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

Total number of printed pages – 3

B. Tech

HSSM 3302

Sixth Semester Regular Examination – 2014

OPTIMIZATION IN ENGINEERING

BRANCH : MECH

QUESTION CODE : F 209

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 non-degenerate and degenerate basic feasible solution of a LPP.

(b) Obtain the dual problem of the following primal LP problem :

Maximize $Z = x_1 + x_2 - x_3$

subject to $x_1 + 3x_2 + 5x_3 \geq 2$

$x_1 + x_2 + 7x_3 \leq 1$

and $x_1, x_2 \geq 0$, x_3 is unrestricted.

(c) What is sensitivity analysis ? Explain.

(d) Define Transhipment problem. How it differs from transportation problem ?

(e) Explain North-west corner rule to find the initial solution in a transportation problem.

(f) Write the mathematical form of an assignment problem.

(g) What is the importance of queueing theory ?

P.T.O.

(h) What is integer programming ? Explain.

(i) What is Kuhn-Tucker condition to solve optimization problem.

(j) Explain genetic algorithm.

2. A farmer has 100 acre farm. He can sell the tomatoes, lettuce or radishes he can raise. The price he can obtain is Rs. 1 per kilogram for tomatoes, Rs. 0.75 per head for lettuce and Rs. 2 per kilogram for radishes .The average yield per acre is 2000 kilogram of tomatoes, 3000 heads of lettuce and 1000 kilograms of radishes. Fertilizer is available at Rs. 0.50 per kilogram and the amount required per acre is 100 kilograms each for tomatoes and lettuce and 50 kilogram for radishes. Labour required for sowing, cultivation and harvesting per acre is 5 man/day for tomatoes and radishes and 6 man/day for lettuce. A total of 400 men/day of labour are available at Rs. 20 per man/day.
Formulate this problem as a L.P.P. Solve the L.P.P to maximize the farmer's total profit using simplex method. 10

3. (a) Solve the following LPP by Big-M method : . 5

Minimize $Z = 2x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

$x_1, \quad x_2 \geq 0$.

(b) Using dual simplex solve the following LPP : 5

Minimize $Z = 3x_1 + x_2$

Subject to $x_1 + x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

$x_1, \quad x_2 \geq 0$

4. Solve the following LPP using Revised simplex method : 10

Minimize $Z = x_1 + 2x_2$

Subject to $2x_1 + 5x_2 \geq 6$

$x_1 + x_2 \geq 2$

$x_1, \quad x_2 \geq 0$

5. (a) Solve the following Transportation problem : 5

Stores/warehouse	S1	S2	S3	S4	availability
A	6	1	9	3	34
B	11	5	2	8	15
C	10	12	41	7	12
D	85	35	50	45	19
demand	21	25	17	17	

(b) Using Hungarian method, solve the following cost minimizing assignment problem : 5

Job/persons	A	B	C	D	E
1	30	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

6. (a) Write short note on M/M/1 and M/M/1/N model of queueing theory. 4

(b) Using Fibonacci search method, minimize the function

$f(x) = x^4 - 15x^3 + 72x^2 - 1135x$ taking the initial range (1, 15). Terminate the search when $|f(x_n) - f(x_{n-1})| \leq 0.50$. . 6

7. Solve the following problem using the projected gradient method : 10

Minimize $Z = 16(x_1 - 2x_2)^2 + (x_1 - 2)^2$

Subject to $x_1 + 2x_2 = 8$

8. Solve the following quadratic programming problem :

Minimize $Z = 2x_1^2 + 4x_1x_2 + 8x_2^2 - 40x_1 + 6x_2$

Subject to $6x_1 + 2x_2 \leq 36$

$x_1, \quad x_2 \geq 0$