Registration no. | | | | | | | | | | |

Total Number of Pages: 03

B.Tech
HSSM3302

6th Semester Regular / Back Examination 2015-16
OPTIMIZATION IN ENGINEERING
BRANCH: AUTO, CIVIL
Time: 3 Hours
Max Marks: 70
Q.CODE: W595
Answer Question No.1 and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: **(2 x 10)**

a) What do you mean by an unbounded solution of a L.P.P ?
b) Define an unsymmetrical dual problem.
c) What is a reduction theorem in assignment problem ?
d) State the necessary and sufficient condition for the existence of a feasible solution of a transportation problem.
e) What is an I.P.P ?
f) State the importance of Branch and Bound technique.
g) What is a Lagrangian Multiplier ?
h) Show that the Hessian matrix of

$$f(x_1, x_2, x_3) = -7x_1^2 - 10x_2^2 - x_3^2 + 4 - 7x_1x_2 - 2x_1x_3 + 4x_2x_3$$

is negative-definite.
i) What are the limitations of sensitivity analysis?
j) Define Transhipment problem.

Q2 **a)** Write the computational procedure of the simplex method for maximizing a L.P.P. **(5)**

b) Solve the following LPP by dual simplex method : **(5)**

Maximize $z = -2x_1 - x_3$

Subject to $x_1 + x_2 - x_3 \geq 5$;

$x_1 - 2x_2 + 4x_3 \geq 8$

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

Q3 **a)** Using big-M method solve the following LPP : **(5)**

Maximize $z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \le 2$;

$x_1 + 3x_2 \ge 3$;

$x_2 \le 4$

and $x_1, x_2 \ge 0$.

b) Explain the relationship between the primal and its dual in linear programming. **(5)**

Q4 By applying Wolfe's method solve the quadratic programming problem: **(10)**

Maximize $z = 4x_1 + 6x_2 - 2x_1^2 - 2x_2^2 - 2x_1x_2$

subject to $x_1 + 2x_2 \le 2$;

and $x_1, x_2 \ge 0$.

Q5 **a)** Solve the integer programming problem **(5)**

Minimize $z = 3x_1 + 2.5x_2$

subject to $x_1 + 2x_2 \ge 20$;

$3x_1 + 2x_2 \ge 50$

and $x_1, x_2 \ge 0$ and integers

by using Branch-Bound method.

b) A company has factories at F_1 , F_2 and F_3 that supply the products to warehouses at W_1 ,W_2 and W_3 .The weekly capacities of the factories are 200,160 and 90 units respectively. The weekly warehouse requirements are 180,120 and 150 units respectively. The unit shipping costs(in rupees) are as follows: **(5)**

Warehouse→ Factory ↓	**W_1**	**W_2**	**W_3**	**Supply**
F_1	16	20	12	200
F_2	14	8	18	160
F_3	26	24	16	90
Demand	180	120	150	

Determine the optimal distribution for this company in order to minimize its total shipping cost.

Q6 **a)** A supermarket has two sales girls at the sales counters. If the service time for each customer is expoential with a mean of 4 minutes, and if the people arrive ina poisson fashion at the rate of 10 an hour, then calculate the : **(5)**

(i)probability that a customer has to wait for being served?

(ii)expected percentage of idle time for each sales girl?

(iii)if a customer has to wait, what is the expected length of his waiting time?

b) Solve the following non-linear Programming problem **(5)**

Maximize $z = 10x_1 - x_1^2 + 10x_2 - x_2^2$

subject to $x_1 + x_2 \le 14$;

$-x_1 + x_2 \le 6$;

and $x_1, x_2 \ge 0$.

by using Kuhn-Tucker conditions.

Q7 **a)** Solve the non-linear programming problem **(5)**

Minimize $z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$

subject to $x_1 + x_2 + x_3 = 20$;

and $x_1, x_2, x_3 \ge 0$.

by using Lagrangian multipliers.

b) A manufacturer of wooden articles produces tables and chairs which requires two types of inputs namely, they being wood and labour. The manufacturer knows that for a table 3 units of wood and 1 unit of labour are required for a chair they are 2 units each. The profit from each table is Rs 20 while it is Rs 16 for each chair. The total available resources for the manufacturer are 150 units wood and 75 units of labour. The manufacturer wants to maximize his profit by distributing his resources for tables and chairs. Formulate the problem as linear programming problem. **(5)**

Q8 Write short notes on any two: **(5 x 2)**

a) Fibonacci search method.

b) Revised simplex method .

c) Hungarian method.

d) Markovian queuing model