Registration *no.*

Total Number of Pages: 02

B.Tech
HSSM3302

6th Semester Regular / Back Examination 2015-16
OPTIMIZATION IN ENGINEERING
BRANCH: EEE, ELECTRICAL, MECH, MINERAL, MINING

Time: 3 Hours
Max Marks: 70
Q.CODE: W473

Answer Question No.1 which is compulsory 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 degenerate basic feasible solution of a L.L.P?
b) Write the use of North – West corner rule.
c) State an assignment problem, mathematically.
d) What is the advantage of dual simplex method?
e) What is a queue? Write the different components of queuing system.
f) What is the necessity of sensitivity analysis?
g) State a general form of a mixed integer programming problem.
h) What is an M/M/1 model?
i) What do you mean by a positive semi-definite matrix?
j) Does a quadratic programming problem differ from a L.P.P? Justify.

Q2 a) Solve the following LPP by dual simplex method : **(5)**

Minimize $z = 3x_1 + x_2$

Subject to $x_1 + x_2 \geq 1$;

$2x_1 + 3x_2 \geq 2$ and $x_1, x_2 \geq 0$.

b) Define a convex set and show that the set of all feasible solutions of a L.P.P is a convex set. **(5)**

Q3 a) Use Simplex method to solve the following LPP **(5)**

Maximize $z = 3x_1 + 5x_2 + 4x_3$

Subject to $2x_1 + 3x_2 \leq 8$;

$2x_2 + 5x_3 \leq 10$;

$3x_1 + 2x_2 + 4x_3 \leq 15$ and $x_1, x_2, x_3 \geq 0$.

b) Define the dual of a linear programming problem and show that the dual of the dual of a L.P.P is the primal itself. **(5)**

Q4 Apply Beale's method for solving the quadratic programming problem: **(10)**

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

subject to $x_1 + 2x_2 \leq 2$

and $x_1, x_2 \geq 0$.

Q5 **a)** Use big-M method to solve the following LPP : **(5)**

Minimize $z = 5x_1 + 3x_2$

Subject to $2x_1 + 4x_2 \le 12$;

$2x_1 + 2x_2 = 10$;

$5x_1 + 2x_2 \ge 10$ and $x_1, x_2 \ge 0$.

b) Solve the integer programming problem **(5)**

Maximize $z = 2x_1 + 3x_2$

subject to $6x_1 + 5x_2 \le 25$;

$x_1 + 3x_2 \le 10$

and $x_1, x_2 \ge 0$ and integers by using Branch-Bound method.

Q6 **a)** Use Kuhn-Tucker conditions to solve the following non-linear Programming problem: **(5)**

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

subject to $2x_1 + 3x_2 \le 6$;

$2x_1 + x_2 \le 4$; and $x_1, x_2 \ge 0$.

b) A marketing manager has five salesman and five sales districts. Considering the capabilities of the salesman and nature of the districts the marketing manager estimates that the sales per month(in hundred rupees) for each salesman in each district would be as follows: **(5)**

Districts → Salesman ↓	**I**	**II**	**III**	**IV**	**V**
A	32	38	40	28	40
B	40	24	28	21	36
C	41	27	33	30	37
D	22	38	41	36	36
E	29	33	40	35	39

Find the assignment of salesman to districts that will result in maximum sales.

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

Minimize $z = 2x_1^2 - 24x_1 + 2x_2^2 - 8x_2 + 2x_3^2 - 12x_3 + 200$

subject to $x_1 + x_2 + x_3 = 11$;

and $x_1, x_2, x_3 \ge 0$ by using Lagrangian multipliers.

b) A bank has two tellers working on savings accounts. The first teller handles withdrawls only. The second teller handles deposits only. It has been found that the service time distribution for the deposits and withdrawls both are expoential with mean service time 3 minutes per customer. Depositors are found to arrive in a poisson fashion through out the day with mean arrival rate 16 per hour. Withdrawers also arrive in a poisson fashion with mean arrival rate 14 per hour. **(5)**

(i)What would be the effect on the average waiting time for depositors and withdrawers if each teller could handle both withdrawls and deposits?

(ii) What would be the effect if this could only be accomplished by increasing the service time to 3.5 minutes?

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

a) Transportation problem.

b) Revised simplex method.

c) Genetic Algorithm.

d) Optimization models in Engineering.