Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **B.TECH**
HSSM3302

5th Semester Regular / Back Examination 2015-16
OPTIMIZATION IN ENGINEERING
BRANCH(S): EEE,ELECTRICAL,MINERAL,MINING
Time: 3 Hours
Max Marks: 70
Q.CODE: T711

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) Express the following LPP in standard form:
$Minimize\ z = x_1 - 2x_2 + x_3$ subject to $2x_1 + 3x_2 + 4x_3 \geq -4$,
$3x_1 + 5x_2 + 2x_3 \geq 7$, $x_1 \geq 0$, $x_2 \geq 0$ and x_3 is unrestricted in sign.

b) Define basic solution and basic feasible solution of a LPP.

c) Describe the general rules for writing the dual of a LPP.

d) What is sensitivity analysis? Discuss its significance briefly.

e) What is the need for integer programming?

f) What is a balanced transportation problem? What are its applications?

g) Briefly explain the important characteristics of queuing system?

h) Give the general form of non-linear programming problem. Also explain unconstrained optimization.

i) What is the significance of Lagrange multipliers?

j) State the Kuhn-Tucker sufficient conditions in non-linear programming.

Q2 a) Use the graphical method to solve the following LPP: (5)
$Minimize\ z = -x_1 + 2x_2$ subject to $-x_1 + 3x_2 \leq 10$, $x_1 + x_2 \leq 6$,
$x_1 - x_2 \leq 2$, and $x_1 \geq 0$, $x_2 \geq 0$.

b) Solve the following LPP by big-M method (5)
$Maximize\ z = 6x_1 + 4x_2$ subject to $2x_1 + 3x_2 \leq 30$, $3x_1 + 2x_2 \leq 24$,
$x_1 + x_2 \geq 3$, $x_1 \geq 0$ and $x_2 \geq 0$.

Q3 Solve the following problem by revised simplex method (10)
$Maximize\ z = x_1 + 2x_2$ subject to $x_1 + x_2 \leq 3$, $x_1 + 2x_2 \leq 5$,
$3x_1 + x_2 \leq 6$ and $x_1 \geq 0$, $x_2 \geq 0$.

Q4 Use branch and bound method to solve the following LPP: (10)
$Minimize\ z = 4x_1 + 3x_2$ subject to $5x_1 + 3x_2 \geq 30$, $x_1 \leq 4$, $x_2 \leq 6$,
$x_1 \geq 0$, $x_2 \geq 0$.and are integers.

Q5 a) Find the optimal solution to the following transportation problem using Modi's method: (5)

Destination/source	D1	D2	D3	D4	Supply
S1	5	3	6	5	15
S2	10	7	12	4	11
S3	7	5	8	4	13
Demand	8	12	13	6	

b) Solve the following assignment problem: (5)

Job/persons	A	B	C	D	E
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	15

Q6 a) 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. (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. (iii) Find the fraction of the day that the phone is in use. (3)

b) Minimize $Z = 4{x_1}^2 + 2{x_2}^2 + {x_3}^2 - 4x_1x_2$ subject to $x_1 + x_2 + x_3 = 15$, $2x_1 - x_2 + 2x_3 = 20$, $x_1, x_2, x_3 \geq 0$ using Lagrange method. (7)

Q7 Solve the following problem using golden section search method for five iterations: (10)
Minimize $Z = 10 + x^3 - 2x - 5e^x$ in the interval $(-5, 5)$

Q8 Using Kuhn-Tucker condition solve the following: (10)
Maximize $-{x_1}^2 - 2{x_2}^2 + 8x_1 + 10x_2$ subject to $3x_1 + 2x_2 \leq 6$, $x_1, x_2 \geq 0$.