Registration No :

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

5th Semester Regular Examination 2018-19
OPTIMIZATION IN ENGINEERING
BRANCH : AEIE, AUTO, CHEM, CIVIL, CSE, ECE,
EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE,
MECH, METTA, MINERAL, MINING, MME, PLASTIC, TEXTILE
Time : 3 Hours
Max Marks : 70
Q.CODE : E077
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) Define Linear Programming Problem?
b) Define Unbounded Solution?
c) What is an Artificial Variable? How does it differ from slack/Surplus Variable?
d) Define Tran-shipment problem. How it differ from transportation problem.
e) Write the mathematical form of an Assignment problem.
f) What is Kuhn-Tucker condition to solve optimization problem.
g) What are the basic characteristics of queueing phenomena?
h) Differentiate between constraint and unconstraint optimization giving example in each case.
i) What is integer programming? Explain
j) Define Lagrange's multiplier?

Q2 **a)** A small manufacture employs 5 skilled men and 10 semi-skilled men for making a product in two qualities:a deluxe model and an ordinary model.The production of a deluxe model requires 2-hours worked by a skilled man and 2-hour work by a semi-skilled man.The ordinary model requires 1-hour work by a semi –skilled man.According to worker union's rules,no man can work more than 8- hours per day.The profit of the deluxe model is Rs. 1000 per unity.Formulate a LPP for this manufacturing situation to determine the production volume of each model such that the total profit is maximized. **(5)**

b) Using Simplex method to solve the following LPP: **(5)**

Maximize $Z=x_1+2x_2+3x_3$

Subject to $2x_1-x_2+x_3\geq 4$

$x_1+x_2+2x_3\leq 8$

$x_2-x_3\geq 2$

x_1, x_2 and $x_3\geq 0$

Q3 **a)** Using Duality to solve the following LPP **(5)**

Maximize $Z=2x_1+x_2$

Subject to $x_1+2x_2\leq 10$

$x_1+x_2\leq 6$

$x_1-x_2\leq 2$

$x_1, x_2\geq 0$

b) Solve the following NLPP by using Kuhn-Tucker condition. **(5)**

Maximize $Z = 3x_1^2+14x_1x_2-8x_2^2$

Subject to $3x_1+6x_2 \leq 72$

$x_1, x_2 \geq 0.$

Q4 a) Solve the Following LPP by using Lagrangian Method. **(5)**

Maximize $Z = 2x_1^2-3x_2^2+18x_2$

Subject to $2x_1+x_2 = 8$

$x_1, x_2 \geq 0$.

b) Find the Initial basic feasible solution of the following transportation problem by Vogel's Approximation method. **(5)**

Stores/warehouse	S_1	S_2	S_3	S_4	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	

Q5 a) The arrival rate of breakdown machines at a maintance shop follows Poisson distribution with a mean of 4 per hour. The service rate of machines by a maintance machines by a maintance machine also follows Poisson distribution with a mean of 3 per hour. The down time cost per hour of a breakdown machines is Rs. 200. The labour rate per hour is Rs. 50. Determine the optimal number of maintance mechanics to be employed to repair the machines such that the total cost is minimized. **(5)**

b) Using Fibonacci search method,minimize the function **(5)**

$F(x)=(100- x)^2$over $60 \leq x\leq 150$,for n=5.

Q6 a) Solve the following problem using the projected gradient method: **(5)**

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

Subject to $x_1+2x_2=8$

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

Job/person	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

Q7 Solve the following LPP, Using Dual Simplex method. **(10)**

Minimize $Z =x_1+2x_2+3x_3$

Subject to $2x_1-x_2+x_3 \geq 4$

$x_1+x_2+2x_3 \leq 8$

$x_2-x_3 \geq 2$

$x_1, x_2, x_3 \geq 0$.

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Linear Programming

b) Hungarian Method

c) M/M/I model in queueing theory

d) Quadratic Programming