Registration No :

Total Number of Pages : 03 **B.Tech.**
HSSM3302

6th Semester Back Examination 2017-18
OPTIMIZATION IN ENGINEERING
BRANCH : AUTO, CIVIL, CSE, EEE, ELECTRICAL, ENV, FASHION, FAT, IT, ITE, MECH, METTA, MINERAL, MINING, MME, PLASTIC, TEXTILE
Time : 3 Hours
Max Marks : 70
Q.CODE : C274
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 basic feasible solution, non degenerate basic feasible solution and degenerate basic feasible solution of a LPP.

b) What is the difference between Canonical Form and Standard Form?

c) Find Dual problem of the following Primal Problem.

$$Max\ z = 7x_1 + 5x_2$$
$$\text{s.t. } 4x_1 + 2x_2 \le 50$$
$$2x_1 - 4x_2 \le 90$$
$$5x_1 + 7x_2 = 43$$
$$\text{Where } x_1, x_2 \ge 0$$

d) What is degeneracy in Transportation Problem?

e) What is traffic intensity in a queuing system? If traffic intensity is 0.3, then what is the percent of time a system remains idle?

f) Differentiate between Regular Simplex Method and Dual Simplex Method.

g) What are Kuhn-Tukker conditions?

h) What is the advantage of Golden search method over Fibonacci search method?

i) Describe branch and bound method.

j) Explain genetic algorithm.

Q2. **a)** Solve the given LPP by Dual Simplex Algorithm. **(5)**

$$Max\ z = 2x_1 + x_2$$
$$\text{s.t. } 3x_1 + x_2 \ge 3$$
$$4x_1 + 3x_2 \ge 6$$
$$x_1 + 2x_2 \le 3$$
$$\text{Where } x_1, x_2 \ge 0$$

b) A manufactures of cylindrical containers receives tin sheets in widths of 30cm and 60cm respectively. For these containers the sheets are to be cut to three different widths of 15cm, 21cm and 27cm respectively. The numbers of containers to be manufactured from these three widths are 400, 200 and 300 respectively. The bottom plates and top covers of the containers are purchased directly from the market. There is no limit on the lengths of standard tin sheets. Formulate the LPP for the production schedule that minimizes the trim losses. **(5)**

Q3. **a)** Find the optimal solution of the following transportation problem by VAM. **(5)**

Source/Destination	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

b) Find the optimal solution of the following Transportation Problem by Stepping Stone Method. **(5)**

Source/Destination	D1	D2	D3	D4	Supply
S1	8	10	7	6	50
S2	12	9	4	7	40
S3	9	11	10	8	30
Demand	25	32	40	23	

Q4. **a)** Solve the given LPP by II-Phase Method. **(5)**

$$Max\ z = 5x_1 + 3x_2$$

s. t. $2x_1 + x_2 \le 1,$

$x_1 + 4x_2 \ge 6,$

Where $x_1,\ x_2 \ge 0$

b) Solve the given LPP by Revised Simplex Algorithm. **(5)**

$$Max\ z = 6x_1 + 12\,x_2$$

s.t. $x_1 + x_2 \le 20,$

$2x_1 + x_2 \le 70,$

$x_1 + 3x_2 \le 40$

Where $x_1,\ x_2 \ge 0$

Q5. **a)** A person repairing radios finds that the time spent on the radio sets has exponential distribution with mean 20 minutes. If the radios are repaired in the order in which they come in and their arrival is approximately Poisson with an average rate of 15 for 8-hour/day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in? **(5)**

b) Solve the given NLPP by Golden Section Search Method. **(5)**

$\min \quad Z = 4\,x^2 + \left[\frac{33}{x}\right]$ In interval [0, 3].

Q6. **a)** Solve the given NLPP by Lagrange's Multiplier Method. **(5)**

$$Max\ z = 5x_1 + x_2 - (\ x_1 - x_2)^2$$

s. t. $x_1 + x_2 = 4$

Where $x_1,\ x_2 \ge 0$

b) Solve the given NLPP by Kuhn-Tucker Conditions. **(5)**

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

s. t. $2x_1 + 3x_2 \le 6$

$2x_1 + x_2 \le 4$

Where $x_1,\ x_2 \ge 0$

Q7. Solve the following Quadratic Programming problem : **(10)**

$$Minimize\ f(x) = 2x_1 - 2x_1{}^2 + 3x_2$$

s.t. $x_1 + 4\,x_2 \leq 4,$

$$x_1 + x_2 \leq 2$$

Where $x_1,\ x_2\ \geq 0$

Q8. a) Solve the following assignment problem : **(5)**

Job/persons	A	B	C	D	E
1	15	10	25	25	10
2	1	8	10	20	2
3	8	9	17	20	10
4	14	10	25	27	15
5	10	8	25	27	12

b) Find the optimal solution to the following Integer Programming Problem. **(5)**

$$Max\ z = x_1 - x_2$$

s. t. $x_1 + 2x_2 \leq 4,$

$6x_1 + 2x_2 \leq 9,$

Where $x_1,\ x_2\ \geq 0$ and $x_1,\ x_2\ are\ integers.$