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Total number of printed pages – 3

B. Tech
HSSM 3302

Sixth Semester Regular Examination – 2014

OPTIMIZATION IN ENGINEERING

**BRANCH(S) : CSE, EEE, ELECTRICAL, ENV, FASHION, FAT,
IT, MINING, MME, PLASTIC, TEXTILE**

QUESTION CODE : F 279

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions :

2×10

- (a) Define a LPP. What do you mean by decision variables in a LPP.
- (b) Define unbounded solution, basic solution in a LPP.
- (c) How can we resolve degeneracy in a LPP ?
- (d) What are the advantages of duality ?
- (e) Write the mathematical model of a Transportation problem.
- (f) Explain Transshipment problem.
- (g) What is the difference between mixed integer programming and pure integer programming ?
- (h) Define transient and steady state of a queuing system.
- (i) What are Kuhn-Tukker conditions ?
- (j) Explain genetic algorithm.

P.T.O.

2. (a) Solve the following LPP using Big- M method :

5

$$\begin{aligned} \text{Minimize } Z &= 4x_1 + x_2 \\ \text{Subject to } 3x_1 + x_2 &= 50 \\ 4x_1 + 3x_2 &\geq 24 \\ x_1 + 2x_2 &\leq 3 \\ x_1, x_2 &\geq 0 \end{aligned}$$

(b) Using duality, solve the following LPP :

5

$$\begin{aligned} \text{Minimize } Z &= 2x_1 + 9x_2 + x_3 \\ \text{Subject to } x_1 + 4x_2 + 2x_3 &\geq 5 \\ 3x_1 + x_2 + x_3 &\geq 4 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

3. Using revised simplex method to solve the following LPP :

10

$$\begin{aligned} \text{Maximize } Z &= x_1 + 2x_2 + 3x_3 - x_4 \\ \text{Subject to } x_1 + 2x_2 + 3x_3 &= 15 \\ 2x_1 + x_2 + 5x_3 &= 20 \\ x_1 + 2x_2 + x_3 + x_4 &= 10 \\ x_1, x_2, x_3, x_4 &\geq 0 \end{aligned}$$



4. (a) Solve the following Transportation problem to maximize the profit :

5

Origin/Destination	A	B	C	Capacity
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
demand	7	9	18	

- (b) Four machines are available to assign four jobs. Find the assignment of machines to the job that will result in maximum profit. 5

Machines/jobs	A	B	C	D
1	10	12	19	11
2	5	10	7	8
3	12	14	13	11
4	8	15	11	9

5. (a) Write the steps to solve the integer programming problem. 5
- (b) In a super market, the average arrival rate of customers is 10 in every 30 minutes, following poisson process. The average time taken by a cashier to list and calculate the customers purchase is two and a half minutes following exponential distribution. Find the probability that the queue length exceeds six. 5

6. Solve the following problem using Golden search method using six iterations: 10

Minimize $Z = x^3 - 2x - 5e^x$ in the interval $(0, 25)$

7. Minimize $Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$

Subject to $x_1 + x_2 + x_3 = 15,$

$$2x_1 - x_2 + 2x_3 = 20,$$

$$x_1, x_2, x_3 = 0$$

Using Lagrange method.

10

8. Solve the following Quadratic Programming problem: 10

Minimize $f(x) = -6x_1 + 2x_1^2 - 2x_1x_2 + 2x_2^2$

Subject to $-x_1 - x_2 = -2$

$$x_1, x_2 = 0$$

