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Total number of printed pages – 3

B. Tech
HSSM 3302

Sixth Semester Regular Examination – 2015

OPTIMIZATION IN ENGINEERING

BRANCH : MECH

QUESTION CODE : J 128

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) Write the standard form of LPP.

(b) Obtain the dual problem of the following primal LP problem

$$\text{Maximize } z = 3x_1 + 2x_2$$

$$\text{Subject to } 2x_1 + 3x_2 \geq 2$$

$$x_1 + x_2 \geq 1$$

$$\text{and } x_1, x_2 \geq 0$$

(c) What is sensitivity analysis ?

(d) Explain Hungarian method.

(e) Define Transshipment problem.

(f) What do you mean by integer programming

(g) What is the advantages of the revised simplex method over simplex method?

(h) What is a general search technique ?

(i) What are Kuhn-Tucker conditions ?

(j) Define convex set, convex function, concave function.

P.T.O.

2. (a) Solve the following LLP by graphical method : 4
- Maximize $z = 3x_1 + 2x_2$
 subject to $-2x_1 + x_2 \leq 1$
 $x_1 + x_2 \leq 3$
 $x_1 \leq 2$
 $x_1, x_2 \geq 0$
- (b) Using Simplex method, solve the following LLP 6
- Maximize $z = 2x_1 + x_2 - 3x_3 + 5x_4$
 Subject to $x_1 + 2x_2 - 3x_3 + 4x_4 \leq 40$
 $2x_1 - x_2 + x_3 + 2x_4 \leq 8$
 $4x_1 - 2x_2 + x_3 - x_4 \leq 10$
 $x_1, x_2, x_3, x_4 \geq 0$
3. (a) Solve the following LPP using Big M method : 5
- Minimize $Z = 4x_1 + 3x_2$
 Subject to $2x_1 + x_2 \geq 10$
 $-3x_1 + 2x_2 \leq 6$
 $x_1 + x_2 \geq 6$
 $x_1, x_2 \geq 0.$
- (b) Use dual simplex method to solve the following LPP 5
- Maximize $Z = 2x_1 + x_2$
 Subject to $x_1 + 2x_2 \leq 10$
 $x_1 + x_2 \leq 6$
 $x_1 - x_3 \leq 2,$
 $x_1 - 2x_2 \leq 1$
 $x_1, x_2 \geq 0.$
4. Use Revised simplex method to solve the following LPP 10
- Maximize $Z = 6x_1 - 2x_2 + 3x_3$
 subject to $2x_1 - x_2 + 2x_3 \leq 2$
 $x_1 + 4x_3 \leq 4$
 $x_1, x_2, x_3 \geq 0$



5. (a) Solve the following Transportation problem :

5

Source/Destination	D1	D2	D3	D4	Supply
S1	270	230	310	690	100
S2	100	450	400	320	80
S3	300	540	350	570	80
Demand	60	120	50	40	

(b) A single clerk in a library issue books whose time is distributed as per Poisson law. He is able to issue 12 books per hour. The readers arrive at the rate of 10 per hour. The library is open 10 hours in each day. Determine

(i) idle rate of the clerk

(ii) percentage of time that the reader has to wait for the book.

5

6. Using Golden section search method,

10

Minimize $f(x) = x^4 - 15x^3 + 72x^2 - 1135x$

Terminate the search when $|f(X_n) - f(X_{n-1})| \leq 0.5$.

The initial range of x is $1 \leq x \leq 15$.

7. Solve the following using Langrange's method

10

Maximize $Z = 4x_1 - 0.02x_1^2 + x_2 - 0.02x_2^2$

such that $x_1 + 2x_2 = 120$.

8. Solve the following Quadratic programming using Wolfe's method

10

Maximize $Z = 4x_1 + 6x_2 - 2x_1^2 + 2x_2^2 + x_3^2$

Subject to $x_1 + x_2 \leq 2$

$x_1, x_2 \geq 0$.

