Registration No. : | | | | | | | | | | |

Total number of printed pages – 4

B. Tech

HSSM 3302 (New)

Sixth Semester (Back) Examination – 2013

OPTIMIZATION IN ENGINEERING

BRANCH : EEE, ELECTRICAL

QUESTION CODE : B302

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 LPP and basic solution of a LPP.

(b) Formulate the following problem as LPP.

A manufacturer can manufacture two different types of products, FRP sheets and FRP bath tubes. Each unit FRP sheets of a particular size needs 5 kg of raw material A and 2 kg of raw material B. Each unit of FRP bath tubes needs 7 kg of raw material A and 1 kg of raw material B. Availability of raw material A in the market is 500 kg and that of raw material B is 100 kg. Each FRP sheet contributes profit of Rs. 100 and FRP tube contributes profit of Rs. 400. What is the most suitable product mix for the manufacturer to maximize profit ?

(c) Find the dual of following :

Minimize $z = x_1 + x_2 + x_3$

Subject to $x_1 + 2x_2 \leq 3$

$x_1 - 3x_2 + 4x_3 = 5$

$2x_1 - x_3 \geq 4$

$x_1, x_2, x_3 \geq 0$

(d) Define balanced and unbalanced transportation problem.

(e) Write any two differences between simplex method and dual simplex method.

P.T.O.

(f) How an unbalanced assignment problem can be solved ?

(g) Write the advantages of queing theory.

(h) What is non-linear programming ?

(i) Define Langrages multiplier.

(j) Explain genetic algorithm.

2. (a) Solve graphically the following LPP : 4

Max $z = 3x_1 + 5x_2$

subject to $2x_1 + 3x_2 \leq 12$

$2x_1 - x_2 = -2$

$x_1 \leq 4$

$x_2 \geq 2$

$x_1, x_2 \geq 0$

(b) Using simplex method, solve the following LPP : 6

Maximize $z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + 2x_2 + x_3 \leq 430$

$3x_1 + 2x_3 \leq 260$

$x_1 + 4x_2 \leq 420$

$x_1, x_2, x_3 \geq 0$

3. (a) Find the optimal solution of the following transportation problem where the cost matrix is given below : 5

Source \ Destination	X	Y	Z	W	Availability
A	19	30	50	10	7
B	70	30	40	60	9
C	40	8	70	20	18
Requirement	5	8	7	14	

(b) Using duality solve the following LPP : 5

Maximize $z = 2x_1 + x_2$

Subject to $x_1 + 2x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2,\ x_1, x_2 \geq 0$

4. (a) Find the initial basic feasible solution to the following transportation problem using Vogel's method : 5

Destination / source	D1	D2	D3	D4	D5	Supply
S1	10	2	16	14	10	300
S2	6	18	12	13	16	500
S3	8	4	14	12	10	825
S4	14	22	20	8	18	375
Demand	350	400	250	150	400	

(b) Find an optimal solution to an assignment problem with the following cost matrix : 5

Job/persons	A	B	C	D	E
1	20	30	25	15	35
2	25	10	40	12	28
3	15	18	22	32	24
4	29	8	34	10	40
5	35	23	17	26	45

5. Write short notes on : 5+5

(a) Branch bound method in integer programming

(b) M/M/I model in queueing theory.

6. Solve the following problem using the projected gradient method : 10

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

Subject to $x_1 + 2x_2 = 8; x_1, x_2, x_3 \geq 0$

7. Solve the following quadratic programming : 10

Max $Z = 40x_1 + 6x_2 - 2x_1^2 - 8x_2^2 - 4x_1x_2$

Subject to $6x_1 + 2x_2 \leq 36, x_1, x_2 \geq 0$

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

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

$x_1, x_2 \geq 0$

using Kuhn-Tucker condition. 10
