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

Total number of printed pages – 3

B. Tech

HSSM 3302

Fifth Semester Examination – 2013

OPTIMISATION IN ENGINEERING

BRANCH : EIE, ICE, IEE, EC, AEIE, ETC, CHEM

QUESTION CODE : C- 403

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 mathematical model of linear programming problem.

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

Minimize $Z = 2x_1 + x_2$

subject to $x_1 + 3x_2 + 2x_3 \geq 2$

$5x_1 + x_2 + 7x_3 = 1$

$x_1 + 3x_2 + 2x_3 \leq 2$

and $x_1, x_2 \geq 0$

(c) Define optimal solution, basic feasible solution, basic variable.

(d) What is sensitivity analysis ?

(e) Define Transshipment problem.

(f) Express Transportation problem as a mathematical model.

(g) What is Markovian Queueing model ? Explain.

(h) What is Langrage multiplier ?

(i) Explain branch-bound method to solve integer programming.

(j) Explain genetic Algorithm.

P.T.O.

2. 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 ?

Solve the above LPP using simplex method. 4+6

3. Solve the following LPP using revised simplex method : 10

Maximize $Z = 3x_1 + x_2 + 2x_3 + 7x_4$

subject to $2x_1 + 3x_2 - x_3 + 4x_4 \leq 40$

$-2x_1 + 2x_2 + 5x_3 - x_4 \leq 35$

$x_1 + x_2 - 2x_3 + 3x_4 \leq 100$

and $x_1 \geq 2,\ x_2 \geq 1,\ x_3 \geq 3,\ x_4 \geq 4$

4. (a) Find the optimal solution of the following transportation problem using Stepping stone method : 5

Destination / source	D1	D2	D3	D4	Supply
S1	42	27	24	35	100
S2	46	37	32	32	60
S3	40	40	30	32	140
Demand	80	40	120	60	

(b) Solve the following Assignment problem : 5

Job/persons	A	B	C	D	E
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	15

5. (a) A T. V. mechanic finds that the time spent on his jobs has an exponential distribution with mean 30 minutes, if he repairs sets in the order in which they come in. If the arrival of sets is approximately Poisson with an average

rate 10 per eight- hour day, what is the mechanic's expected idle time each day. How many jobs are ahead of the average set just brought in ? 5

(b) A car park contains 15 cars. The arrival of cars is Poisson, at a mean rate of 10 per hour. The length of time each car park is exponential distribution with mean of 0.5 hours. How many cars are in the park on an average ? 5

6. Solve the following problem using golden search method for 5 iterations :

Minimize $Z = 10 + x^3 - 2x - 5e^x$ in the interval $(-5, 5)$ 10

7. Solve the following quadratic programming problem : 10

Minimize $Z = x_1^2 - x_1x_2 + 3x_2^2 - 4x_2 + 4$

subject to $x_1 + x_2 \leq 1$

$x_1, x_2 \geq 0$

8. Solve the following NLPP using Kuhn-Tukker conditions : 10

Maximize $Z = 8x_1 + 10x_2 - x_1^2 - x_2^2$

subject to $3x_1 + 2x_2 \leq 6$

$x_1, x_2 \geq 0$