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

Total number of printed pages – 3

B. Tech

HSSM 3302

Fifth Semester Examination – 2013

OPTIMISATION IN ENGINEERING

BRANCH : ELECTRICAL, IT, FASHION, FAT, MINING, ENV, MINERAL, EEE, PLASTIC, CSE, MM, MME, TEXTILE

QUESTION CODE : C-402

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.

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

Maximize $Z = 5x_1 + 3x_2$

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

$x_1 + x_2 + 7x_3 = 1$

and $x_1, x_2 \geq 0$

(c) Define non-degenerate basic feasible solution and degenerate basic feasible solution. How to avoid the degeneracy ?

(d) What is the necessity of sensitivity analysis ?

(e) What is the difference between Simplex method and Dual simplex method ?

(f) Write the mathematical form of an assignment problem.

(g) What is the difference between Transportation problem and Transshipment problem ?

(h) What is M/M/I queueing model ? Explain.

(i) Write the steps of revised simplex method.

(j) What is Kuhn - Tucker condition to solve optimization problem ?

P.T.O.

2. Solve the following LPP :

Minimize $Z = 3x_1 + 4x_2$

subject to $10x_1 + 3x_2 \geq 30$

$2x_1 + x_2 \geq 6$

$2x_1 + 9x_2 \geq 27$

$x_1, x_2 \geq 0$

(a) Using graphical method. 4

(b) Using Big-M method. 6

3. Solve the following Integer Programming problem : 10

Maximize $Z = 2x_1 + 2x_2$

subject to $5x_1 + 3x_2 \leq 8$

$2x_1 + 4x_2 \leq 8$

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

4. (a) Find the optimal solution to the following transportation problem using Modi's method : 5

Destination / source	D1	D2	D3	D4	Supply
S1	5	3	6	5	15
S2	10	7	12	4	11
S3	7	5	8	4	13
Demand	8	12	13	6	

(b) Solve the following assignment problem : 5

Job/persons	A	B	C	D	E
1	12	8	7	15	14
2	7	9	17	14	10
3	9	6	12	6	7
4	7	6	14	6	10
5	99	6	12	10	6

5. (a) Customers arrive at a sales counter manned by a single person according to a Poisson process with a man rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer. 5

(b) Customers arrive at first class ticket counter of a theatre at the rate of 12 per hour. There is one clerk serving the customers at the rate of 30 per hour. Find : 5

(i) What is the probability that there is no customer in the booking counter ?

(ii) What is the probability that there are more than two customers in the counter ? 5

6. Solve the following NLPP using Langragean multiplier method : 10

Maximize $Z = x_1^2 + x_2^2 + x_3^2$

subject to $x_1 + x_2 + 3x_3 = 2$

$5x_1 + 2x_2 + x_3 = 5$

$x_1, x_2, x_3 \geq 0$

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 problem using golden search method for 6 iterations : 10

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