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

Total number of printed pages – 3

B. Tech

HSSM 3302 (New)

Sixth Semester (Back) Examination – 2013

OPTIMIZATION IN ENGINEERING

BRANCH : CIVIL

QUESTION CODE : B303

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 artificial variable, pivot element of a LPP.

(b) Define Non degenerate basic feasible solution and degenerate basic feasible solution.

(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) What is sensitivity analysis ?

(e) What is the criteria of optimality in Transportation problem ?

(f) What is the difference between revised simplex method and simplex method ?

(g) What is Queueing Discipline ?

(h) Explain Quadratic Programming.

(i) What is M/M/I (N/FCFS) model.

(j) What are Langrange multipliers.

P.T.O.

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

Minimize $z = 3x_1 + 5x_2$

subject to $-3x_1 + 4x_2 \leq 12$

$2x_1 + 3x_2 \leq 12$

$2x_1 - x_2 = -2$

$x_1 \leq 4, x_2 \geq 2$;

$x_1, x_2 \geq 0$

(b) Using Big-M method solve the following LPP : 6

Maximize $z = 2x_1 + 4x_2 - 3x_3$

Subject to $x_1 + x_2 + x_3 \geq 8$

$x_1 - x_2 \geq 1$

$3x_1 + 4x_2 + x_3 \leq 40$

$x_1, x_2, x_3 \geq 0$

3. (a) Using dual simplex method to solve the LPP : 5

Maximize $z = -2x_1 - x_3$

Subject to $x_1 + x_2 + x_3 \geq 5$

$x_1 - 2x_2 + 4x_3 \geq 8$

$x_1, x_2, x_3 \geq 0$

(b) Find the optimal solution of the following transportation problem using Vogel's approximation method to find the initial basic feasible solution. 5

	Ware houses				Availability
	19	30	50	10	7
	70	30	40	60	9
	40	8	70	20	18
Requirement	5	8	7	14	

4. A tax consulting firm has 3 counters in its office to receive people who have problems concerning their income, wealth and sales taxes. On the average 48

persons arrive in an 8-hours day. Each tax adviser spends 15 minutes on an average on an interval. If the arrivals follow Poisson distribution and service times are according to exponential distribution, find 10

(a) the average number of customers in the system.

(b) average number of customers waiting to be served.

(c) average time a customers spends in the system.

(d) average waiting time for a customer.

(e) the number of hours each week a tax adviser spends performing his job.

5. Solve the following mixed integer problem by the branch and bound method : 10

Maximize $z = x_1 + x_2$

Subject to $2x_1 + 5x_2 \leq 16$

$6x_1 + 5x_2 \geq 30$

$x_1, x_2 \geq 0$ and integers.

6. Use the method of Langrangian multipliers to solve the following NLPP : 10

Optimize $z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$

Subject to $x_1 + x_2 + x_3 = 20$

$x_1, x_2, x_3 \geq 0$

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. (a) Explain genetic algorithm. 5

(b) Write the different steps involved in project gradient method giving an example. 5