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

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B. Tech

HSSM 3302

Sixth Semester Regular Examination – 2015

OPTIMIZATION IN ENGINEERING

BRANCH (S) : CSE, EEE, ELECTRICAL, FASHION, IT, MINING, MME, PLASTIC, TEXTILE

QUESTION CODE : J 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) How do you recognize that an LPP is unbounded while using the simplex method ?

   (b) What is the advantage of dual simplex method over simplex method ?

   (c) Why do you perform a sensitivity analysis ?

   (d) Write the mathematical form of a transportation problem.

   (e) Explain the concept of branch and bound method in integer programming.

   (f) Differentiate between transportation problem and assignment problem

   (g) What are different types of queuing discipline ?

   (h) What are the primary uses of Kuhn-Tucker necessary and sufficient conditions ?

   (i) Define linear, non-linear function with examples.

   (j) What is quadratic programming ? Give one example .

2. A small manufacturer employs 5 skilled men and 10 semi-skilled men and makes an article in two qualities, a deluxe model and an ordinary model. The making of a deluxe model requires 2 hours work of a skilled man and 2 hours work by a

semi-skilled man. The ordinary model requires I hour work by a skilled man and 3 hours work by a semi-skilled man. No man can work for more than 8 hours per day. The manufacturer's clear profit of the deluxe model is Rs 10 and of the ordinary model is Rs 8. Formulate the problem into a LPP model to maximize his profit and using a suitable simplex method find the optimal solution. 10

3. Write the principle of obtaining dual from the primal. Convert the following primal to dual. 10

Maximize $Z = 3x_1 + 5x_2$

Subject to $3x_1 + 2x_2 \leq 20$

$x_1 + 3x_2 \leq 8$

$2x_1 - 4x_2 \leq 5$

$x_2 \leq 2$

$x_1, x_2 \geq 20$

using duality , solve the above LPP.

4. Using branch and bound method ,solve the following IPP : 10

Maximize $Z = 7x_1 + 9x_2$

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

$7x_1 + x_2 \leq 35,$

$x_1 , x_2 \leq 0$

x_1 , x_2 are integers

5. (a) Solve the following Transportation problemto minimize the transportation cost 5

Source/Destination	A	B	C	D	Supply
1	19	30	50	10	7
2	70	30	40	60	9
3	40	8	70	20	18
Demand	5	8	7	14	

(b) A batch of five jobs can be assigned to five operators. Each job must be performed only by one operator. The cost of processing of each job by each operator is given below in Rs. The set up time for each job on various machines is given by the following table :

		Machines				
		1	2	3	4	5
Jobs	1	7	5	9	8	11
	2	9	12	6	11	10
	3	8	5	4	6	8
	4	7	3	6	8	5
	5	5	6	7	5	11

Determine the assignment of jobs to the operators so that it will result in minimum cost. 5

6. (a) Arrival rate of telephone calls at a telephone booth are according to Poisson distribution with an average of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed with mean 3 minutes. 5

(i) Determine the probability that a person arriving at a booth will have to wait.

(ii) Find the average queue length that is formed from time to time.

(iii) Find the fraction of the day that the phone is in use.

(b) Solve the following problem using Fibonacci search method for 5 iterations.

Minimize $Z = 2x^2 + 33/x$ in the interval (0 ,5) 5

7. Minimize $Z = 25 (x_1 - 3x_2)^2 + (x_1 - 3)^2$ 10

Subject to $x_1 + 2x_2 = 9$

using project gradiant method.

8. Solve the following Quadratic programming using Wolfe's method : 10

Maximize $Z = 2x_1 + 3x_2 - 2x_1^2$

Subject to $x_1 + x_2 \leq 2$

$x_1 + 4x_2 \leq 4$

$x_1 , x_2 \geq 0$