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

Total number of printed pages – 4

B. Tech

HSSM 3302

Sixth Semester Examination – 2013

OPTIMIZATION IN ENGINEERING

BRANCH : ELECT / EEE / MINERAL / MINING / IT / CSE / ENV. / TEXT / MME / FASHION / PLASTIC / MM

QUESTION CODE : A 216

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 characteristics of a linear programming problem.

   (b) What do you mean by unbounded solution and degenerate solution of LPP ? How to identify such cases ?

   (c) Write the procedure for converting a LPP into its dual.

   (d) What are the advantages of two-phase simplex method over simplex method ?

   (e) Do you think that the transportation problem is a linear programming problem ? Justify.

   (f) Explain how an unbalanced assignment problem is handled.

   (g) What are the general characteristics of a queueing model ?

   (h) Explain the concept of Fibonacci search method.

   (i) What is the importance Lagrange multiplier in non-linear programming ?

   (j) Explain how Kuhn-Tuker conditions have extended the theory of Lagrange multiplier theory.

P.T.O.

2. (a) Three grades of Coal A, B and C contain phosphorous and ash as impurities. For a particular industry process, a maximum of 100 tons of coal is required which should not contain more than 4% of ash and 0.04% of phosphorus. The percentage of impurities and the profits from each grade are given below :

Coal	% of Phosphorus	% of Ash	Profit (Rs/ton)
A	0.01	4	22
B	0.04	1	20
C	0.03	3	21

Formulate the problem in to a LPP to find the proportions in which the three grades are to be used in order to maximize the profit. 5

(b) Using graphical method, solve the following LPP : 5

Maximize $Z = 10x_1 + 15x_2$

subject to $2x_1 + x_2 \leq 26$

$2x_1 + 4x_2 \leq 56$

$-x_1 + x_2 \leq 5,$

$x_1, x_2 \geq 0.$

3. (a) Using simplex method, solve the LPP : 6

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

subject to $x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8,$

$x_1, x_2, x_3 \geq 0.$

(b) Write the dual of the following LPP : 4

Maximize $Z = 3x_1 - 2x_2 + 5x_3$

subject to $2x_1 + 4x_2 + x_3 \geq 1$

$5x_1 + x_2 + 2x_3 \geq 7$

$6x_1 - 2x_2 - 3x_3 \geq 10$

$4x_1 + 5x_2 - x_3 \leq 3$

$x_1, x_2, x_3 \geq 0.$

2. (a) Three grades of Coal A, B and C contain phosphorous and ash as impurities. For a particular industry process, a maximum of 100 tons of coal is required which should not contain more than 4% of ash and 0.04% of phosphorus. The percentage of impurities and the profits from each grade are given below :

Coal	% of Phosphorus	% of Ash	Profit (Rs/ton)
A	0.01	4	22
B	0.04	1	20
C	0.03	3	21

Formulate the problem in to a LPP to find the proportions in which the three grades are to be used in order to maximize the profit. 5

(b) Using graphical method, solve the following LPP : 5

Maximize $Z = 10x_1 + 15x_2$

subject to $2x_1 + x_2 \leq 26$

$2x_1 + 4x_2 \leq 56$

$-x_1 + x_2 \leq 5,$

$x_1, x_2 \geq 0.$

3. (a) Using simplex method, solve the LPP : 6

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

subject to $x_1 + x_2 + x_3 \leq 9$

$2x_1 + 3x_2 + 5x_3 \leq 30$

$2x_1 - x_2 - x_3 \leq 8,$

$x_1, x_2, x_3 \geq 0.$

(b) Write the dual of the following LPP : 4

Maximize $Z = 3x_1 - 2x_2 + 5x_3$

subject to $2x_1 + 4x_2 + x_3 \geq 1$

$5x_1 + x_2 + 2x_3 \geq 7$

$6x_1 - 2x_2 - 3x_3 \geq 10$

$4x_1 + 5x_2 - x_3 \leq 3$

$x_1, x_2, x_3 \geq 0.$

(b) What do you mean by *M/M/1/3/3* queueing model ? Set up the transition diagram of this model. 5

7. Solve the following quadratic programming problem : 10

Minimize $Z = 2x_2^2 + 3x_1^2 + 3x_1x^2 + 25(x_1 + x_2)$

Subject to $x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0$

8. Write short notes on : 5×2

(a) Constrained optimization Techniques

(b) Genetic algorithm.