

16/7/2016

4E2039

Roll No. _____

Total No of Pages: **4**

4E2039

B.Tech. IV-Sem (Back) Exam; June-July 2016

Civil Engineering

4CE6.2(O) Optimization Techniques

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Main & Back): 26

Min. Passing Marks (Old Back): 24

Instructions to Candidates:-

*Attempt any **five** questions, selecting **one** question from **each** unit. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. _____

2. _____

UNIT-I

Q.1 (a) What do you mean by optimization techniques? Write its applications in the field of engineering. [8]

(b) A company produces two types of leather belts A and B. The respective profits are Rs.10 and Rs.5 per belt. The supply of raw material is sufficient for making 850 belts per day. For A, a special type of buckle is required and 500 are available per day. There are 700 buckles available for belt B per day. Belt A requires twice as much time as that required for belt B. The company can produce 500 belts if all of them were of type A. Formulate a model for the above problem. [8]

OR

- Q.1 (a) Prove that the semi vertical angle of the cone of maximum value and of given slant height is $\tan^{-1}\sqrt{2}$. [8]
- (b) Find the dimensions of a box of largest volume that can be inscribed in a sphere of unit radius. [8]

UNIT-II

- Q.2 (a) Solve the following LPP by simplex method- [8]

$$\text{Max. } z = 3x_1 + 5x_2 + 4x_3$$

$$\text{s.t. } 2x_1 + 3x_2 \leq 8$$

$$2x_2 + 5x_3 \leq 10$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

- (b) Solve the dual of the following LPP by simplex method- [8]

$$\text{Min. } z = 2x_1 + 9x_2 + x_3$$

$$\text{s.t. } x_1 + 4x_2 + 2x_3 \geq 5$$

$$3x_1 + x_2 + 2x_3 \geq 4$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

OR

- Q.2 (a) Solve the following LPP by revised simplex method- [8]

$$\text{Max. } z = x_1 + 2x_2$$

$$\text{s.t. } x_1 + x_2 \leq 3$$

$$x_1 + 2x_2 \leq 5$$

$$3x_1 + x_2 \leq 6$$

$$\text{and } x_1, x_2 \geq 0$$

- (b) Use Big. M - Method to solve. [8]

$$\text{Max. } z = 3x_1 + 2x_2 + x_3$$

$$\text{s.t. } -3x_1 + 4x_2 + x_3 = 7$$

$$-3x_1 + 2x_2 + 2x_3 = 8$$

$$x_1, x_2, x_3 \geq 0$$

UNIT-III

- Q.3 (a) Solve the transportation problem for which the cost, availabilities and destinations are given below. [8]

	W ₁	W ₂	W ₃	W ₄	Supply
F ₁	2	3	5	1	7
F ₂	7	3	4	6	9
F ₃	4	1	7	2	18
Demand	5	8	7	14	

- (b) Solve the following assignment problem [8]

	I	II	III	IV	V
A	1	3	2	3	6
B	2	4	3	1	5
C	5	6	3	4	6
D	3	1	4	2	2
E	1	5	6	5	4

OR

- Q.3 (a) Solve the following unbalanced transportation problem: [8]

	X	Y	Z	Availability
A	7	3	6	5
B	4	6	8	10
C	5	8	4	7
D	8	4	3	3
Demands	5	8	10	

- (b) Solve the following assignment problem. [8]

Jobs \ Machines			
	D ₁	D ₂	D ₃
O ₁	20	27	30
O ₂	10	18	16
O ₃	14	16	12

UNIT-IV

Q.4 (a) Minimize $f = 2x_1^2 + x_2^2$, from the starting point $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ using univariate method or other direct search method. [8]

(b) Minimize $f(x_1, x_2) = \frac{1}{3}(x_1 + 1)^3 + x_2$ [8]

s.t. $g_1(x_1, x_2) = 1 - x_1 \leq 0$

$g_2(x_1, x_2) = -x_2 \leq 0$

OR

Q.4 (a) What are various methods employed in solving the non-linear optimization problems. Give a brief of any one method. [8]

(b) Use descent method to minimize $f_1(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_2^2$, by taking the starting point $X_1 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ [8]

UNIT-V

Q.5 (a) Use dynamic programming to solve: [8]

$$\text{Min } Z = u_1^2 + u_2^2 + u_3^2$$

s.t. $u_1 + u_2 + u_3 \geq 15$

$$u_1, u_2, u_3 \geq 0$$

(b) Define "Bellman's principle of optimality" what are characteristics of dynamic programming problem. Write the engineering applications of dynamic programming. [8]

OR

Q.5 (a) Use dynamic programming to solve.

$$\text{Min } Z = y_1^2 + y_2^2 + y_3^2$$

s.t. $y_1 + y_2 + y_3 = 10$

$$y_1, y_2, y_3 \geq 0$$

(b) Solve the problem by dynamic programming technique. [8]

$$\text{Min } Z = u_1 u_2 u_3$$

s.t. $u_1 + u_2 + u_3 = 5$

$$u_1, u_2, u_3 \geq 0$$