4E2039

Roll No. _____ Total No of Pages: 4

4E2039
B. Tech. IV Sem. (Back) Exam., June/July-2014
Civil Engineering
4CE6.2 Optimization Techniques

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 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) Write a short note on historical development of Optimization Techniques. [8]

(b) Write the main applications of Optimization Techniques in Engineering. [8]

OR

Q.1 (a) Define the Optimization Techniques. Classify the Optimization Techniques. [2+6=8]

(b) Discuss the formulation of an engineering problem as a mathematical programming problem. [8]

UNIT-II

Q.2 (a) Solve the following LPP by Big M- Method [10]

Min $z = 5x_1 + 2x_2$

s.t. $3x_1 + x_2 = 4$

$2x_1 + x_2 \geq 3$

$x_1 + 2x_2 \leq 3$

and $x_1, x_2 \geq 0$

(b) Find the dual problem of the following LPP. [6]

Max. $z = x_1 + 3x_2$

s.t. $-3x_1 - 2x_2 \geq -6$

$3x_1 + x_2 = 4$

and $x_1, x_2 \geq 0$

OR

Q.2 Solve the following LPP by using revised simplex method: [16]

Max. $z = 6x_1 - 2x_2 + 3x_3$

s.t. $2x_1 - x_2 + 2x_3 \leq 2$

$x_1 + 4x_3 \leq 4$

and $x_1, x_2, x_3 \geq 0$

UNIT-III

Q.3 A company is spending Rs. 1000 on transportation of its units to four warehouses from three factories. What can be the maximum saving by optimal scheduling? Solve the following transportation problem: [16]

Factory ↓	← Warehouses →				Factory capacity
	W1	W2	W3	W4	
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Warehouses requirement	5	8	7	14	34

OR

Q.3 Define the unbalanced Assignment Problem. Five wagons are available at stations 1, 2, 3, 4, and 5. These are required at five stations I, II, III, IV and V. The kilometers between various stations are given by the following table. How should the wagons be transported so as to minimize the total distance covered? [16]

	I	II	III	IV	V
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

UNIT-IV

Q.4 (a) Find the maximum value of the function - [8]

$$f(x) = \begin{cases} 2x+1, & x \leq 2 \\ -5x+15, & x > 2 \end{cases}$$

by the unrestricted search method starting from $x_1 = 0$ and moving with the step size of $S = 0.4$.

(b) Write a short note on direct search methods. [8]

OR

Q.4 (a) Minimize -

$f(x) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_2^2$

from the starting point $x_1 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ by Powell's method. [8]

(b) Using the steepest descent method, minimize

$f(x) = 2x_1^2 + 2x_1 x_2 + x_2^2 + x_1 - x_2$, starting from $x_1 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ [8]

UNIT-V

Q.5 (a) State the Bellman's principle of optimality. Use dynamic programming to solve the following - [8]

Max. $z = x_1 x_2 x_3$

s.t. $x_1 + x_2 + x_3 = 9$

and $x_1, x_2, x_3 \geq 0$

(b) Use dynamic programming to Solve the following. [8]

Min. $z = x_1^2 + x_2^2 + x_3^2$

s.t. $x_1 + x_2 + x_3 \geq 30$

and $x_1, x_2, x_3 \geq 0$

OR

Q.5 (a) Write a short note on application of dynamic programming in LPP. [8]

(b) Solve the given LPP by using dynamic programming: [8]

Max. $z = 2x_1 + 5x_2$

s.t $2x_1 + x_2 \leq 43$

$2x_2 \leq 46$

and $x_1, x_2 \geq 0$
