4E2039

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B. Tech. (Sem. - IV) (Main/Back) Examination, June/July - 2011
4CE6.2 Optimization Techniques
Civil Engg.

Time : **3** Hours] [Total Marks : **80**
[Min. Passing Marks : **24**

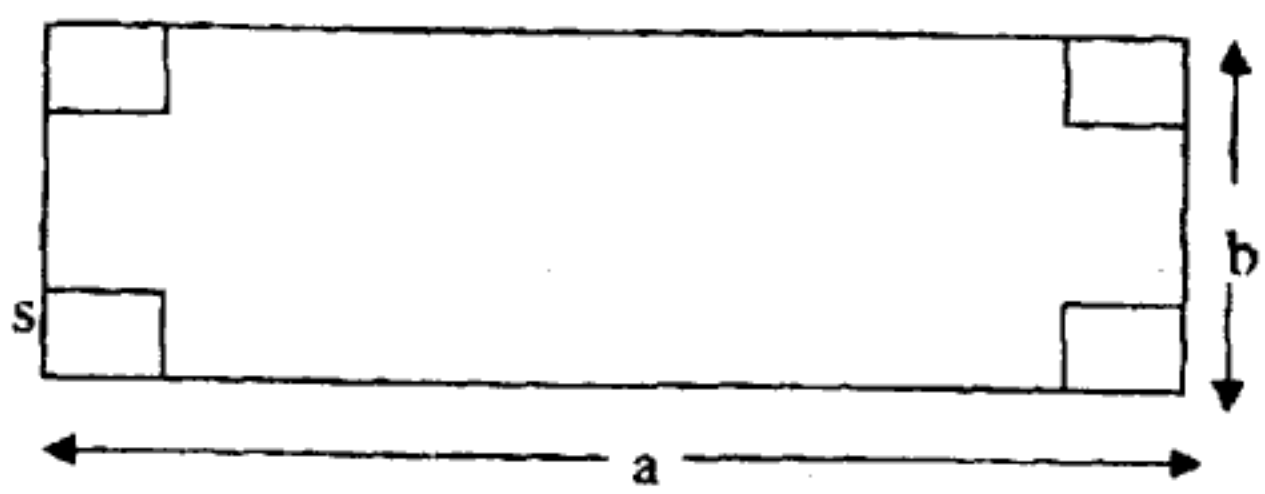
*Attempt overall **5** questions. All questions carry **equal** marks. Assume missing data suitable if any and specify the same.*

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. **Nil** 2. **Nil**

1 (a) (i) What are the engineering application of optimization methods ? Explain briefly.

(ii) A rectangular plate of size axb is to be used to prepare a box open at top by cutting four rectangular portions at each corners and folding along the edge. Find the size s of the smaller rectangular portions to be cut to obtain the maximum volume in the box.



OR

(b) (i) What are the classifications of optimization problems ? Explain any one in briefly.

(ii) A solid cone is to be moulded by using minimum material and to obtain maximum volume. Find the ratio of base diameter to height.

4+12

z (a) What do you mean by a linear programming problem ?

(b) Using Simplex method solve the following linear programming problem ?

Max $z = x_1+3\ x_2\ -2x_3$

Subject to

$3x_1\ -x_2\ +2x_3 <=7$

$-2\ x_1\ +4\ x_2\ <=12$

$4\ x_1+3\ x_2\ +8\ x_3 <=7$

$x_1,\ x_2,\ x_3 >=0$

OR

2 (a) What do you mean by Duality in Linear Programming ?

(b) Write the dual of the Linear Programming problem given above in and find the solution.

4+12

3 (a) What do you mean by a sensitivity analysis of linear programming problem ?

(b) Using simplex method solve the following linear programming problem.

Max $z = x_1+3\ x_2\ -2x_3$

Subject to

$3x_1\ -x_2\ +2x_3 <=7$

$-2\ x_1\ +4\ x_2\ <=12$

$4\ x_1+3\ x_2\ +8\ x_3 <=7$

$x_1,\ x_2,\ x_3 >=0$

OR

3 (a) What do you mean by Transportation problem ?

(b) Find and solve the dual of the Linear Programming problem given above.

4+12

4 (a) What are the methods employed in solving the Non-linear optimization problems. Give a brief of any one method.

(b) Find the minimum of the function $f = x^5 - 5x^3 - 20\ x + 10$ using golden section method, in the interval (0,5)

OR

4 (a) What do you mean by direct search method employed in solving the Non-linear optimization problems. Give a brief of the method.

(b) Find the minimum of the function $f = x^5 - 5x^3 - 20\ x + 10$ using Fibonacci method, in the interval (0,5)

4+12

5 (a) What do you mean by multi-stage decision in dynamic methods of optimization problems. Give a brief of any one method.

(b) Solve the following LP problem by dynamic programming :

Max $z = 5x_1 + 4x_2$

Subject to

$$2x_1 + x_2 <= 25$$
$$3x_1 + 2x_2 <= 15$$
$$x_2 <= 10$$
$$x_1, x_2 >= 0$$

OR

5 (a) What do you mean by dynamic programming in optimization problems. Give a brief of the method.

(b) Differentiate between an initial value problem and final value problem. How to convert an initial value problem and final value problem ?

4+12