M.E. First Semester (Electrical (Electrical Power System)) (F.T.)

13299 : Power System Optimization : 1 SEPS 1

P. Pages : 2

AU - 3256

Time : Three Hours

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Max. Marks : 80

Notes :
1. Answer **Two** question from Section A and **Two** question from Section B.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams and chemical equations should be given wherever necessary.
5. Illustrate your answer necessary with the help of neat sketches.
6. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION – A

1. a) Find the extreme points of the function :   **7**
$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$.

   b) State and explain Kuhn – Tucker conditions for multivariable optimization problem.   **6**

   c) Find the dimensions of a box of a largest volume that can be inscribed in a sphere of unit radius.   **7**

2. a) Consider the following linear programming model and solve it using the two-phase method.   **10**

   Minimize $z = 12x_1 + 18x_2 + 15x_3$

   Subject to :

   $4x_1 + 8x_2 + 6x_3 \geq 64$

   $3x_1 + 6x_2 + 12x_3 \geq 96$

   x_1, x_2 and $x_3 \geq 0$

   b) Determine the optimum basic feasible solution to the following transportation problem :   **10**

	A	B	C	Supply
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Demand	4	2	2	8

3. a) Write an algorithm for steepest descent method.   **10**

   Minimize $f = 2x_1^2 + x_2^2$

   using steepest descent method with starting point (1, 2). Perform three iterations.

   b) Enumerate the limitations of Fibonacci search method and show that the method obtains a reduction ratio : $\dfrac{L_n}{L_o} = \dfrac{1}{F_n}$.   **10**

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SECTION – B

4. a) Solve the following LP problem by dynamic programming :-   **10**
        Minimize:

        $$f(x_1, x_2) = 50x_1 + 100x_2$$

        Subject to :

        $$10x_1 + 5x_2 \leq 2500$$
        $$4x_1 + 10x_2 \leq 2000$$
        $$x_1 + 1.5x_2 \leq 450$$

        and $\quad x_1 \geq 0, x_2 \geq 0$

    b) Explain the concept of suboptimization and principle of optimality.   **10**

5. a) Table below shows jobs, their normal time and cost, and crash time and cost for a project.   **14**

Job	Normal Time (days)	Cost (Rs.)	Crash Time (days)	Crash Cost (Rs.)
(1 – 2)	6	1400	4	1900
(1 – 3)	8	2000	5	2800
(2 – 3)	4	1100	2	1500
(2 – 4)	3	800	2	1400
(3 – 4)	Dummy	-	-	-
(3 – 5)	6	900	3	1600
(4 – 6)	10	2500	6	3500
(5 – 6)	3	500	2	800

Indirect cost for the project is Rs. 300 per day.
        i)   Draw the network of the project.
        ii) What is the normal duration cost of the project?
        iii) If all activities are crashed, what will be the project duration and corresponding cost?
        iv) Find the optimum duration and minimum project cost.

    b) What are various advantages of GA over traditional methods?   **6**

6. a) What are the basic operations used in Genetic Algorithm? What is a fitness function in   **10**
        Genetic Algorithm?

    b) Explain how Genetic Algorithm can be applied for reactive power optimization in electrical   **10**
        power system. ·

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