SUBJECT CODE NO: E-8150
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Mechanical) Examination Nov/Dec 2017
Advanced Optimization Techniques
(Revised)

[Time: Three Hours]   **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
         i) Solve <u>any Three</u> questions from each section.
         ii) Figure to right indicates full marks.
         iii) Assume suitable data if required and state it clearly.
         iv) Use of non-programmable calculator is allowed.

Section A

Q.1   Use Fibonacci search method to solve   13
         Minimize $f(x) = x^2 + 54/x$ within bound (0,5)

Q.2   Find the minimum of $f = x\,(x-3/2)$ by starting from 0.0 with an initial step size of 0.05   13
         Using exhaustive search method.

Q.3   Write down K-T condition for NLP problem. Check whether the points are K-T points.   13
         Minimize $f(x) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$
         Subject to,
         $g_1(x) = 26 - (x_1 - 5)^2 - x_2 \geq 0$
         $g_2(x) = 20 - 4x_1 - x_2 \geq 0$
         $x_1, x_2 \geq 0$
         The point are $(1, 5)^T$, $(3, 2)^T$

Q.4   Minimize $f(x) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $X_1 = \{0\}$ using   13
         Cauchy method.

Q.5   Write a short note on- (<u>Any Two</u>)   14

             a) Constrained optimization

             b) Optimality Criteria

             c) Single variable optimization.

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Section –B

Q.6 A farmer has a 100 acre farm. He can sell all the tomatoes, lettuce or radishes he can raise. The price he can obtain is Rs 1 per kg for tomatoes, Rs 0.75 a head for lettuce and Rs 2 per kg for radishes. The average yield per acre is 2000 kg for tomatoes, 3000 heads of lettuce and 1000 kg of radishes. Fertilizer is available at Rs 0.50 per kg and the amount required per acre is 100 kg each for tomatoes and lettuce and 50 kg for radishes. Labour required for sowing, cultivating and harvesting per acre is 5 man days for tomatoes and radishes and 6 man days for lettuce. A total of 400 man days of labour are available at Rs. 20 per man day. Solve the problem for maximization of farmer's profit.   13

Q.7 Maximize $Z = 5x_1 + 7x_2$ 13
Subjected to,
$-2x_1 + 3x_2 \leq 6$
$6x_1 + x_2 \leq 30$
$x_1, x_2 \geq 0$ and integer
Solve using cutting plane (Gomory's) method.

Q.8 Use two phase simplex method to   13
Maximize $Z = 3x_1 + 2x_2 + 2x_3$
Subjected to,
$5x_1 + 7x_2 + 4x_3 \leq 7$
$-4x_1 + 7x_2 + 5x_3 \geq -2$
$3x_1 + 4x_2 - 6x_3 \geq \dfrac{29}{7}; x_1, x_2, x_3 \geq 0$

Q.9 a) What is genetic algorithm?   07

b) Describe simulated annealing.   06

Q.10 Write a short note on- (<u>Any Two</u>)   14

    a) Global optimization

    b) Sensitivity Analysis for NIP

    c) Simplex Algorithm

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