Printed pages: 01 **Sub Code: MTME041**

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M. TECH.
(SEM -II) THEORY EXAMINATION 2018-19
OPTIMIZATION TECHNIQUES & DESIGN OF EXPERIMENTS

Time: 3 Hours *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a. What is Descent method?
b. What is optimization? Give engineering application of optimization.
c. Define Fabonacci numbers.
d. Explain constraints with example.
e. Explain objective function with example.
f. What is an active constraint?
g. Define integer linear programming and write its type.

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a. Write algorithm of Golden section search method?
b. Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_1^2$ from the starting point $X_1=\{0\}$ using Powell's method.
c. In a certain reservoir pump installation, the first cost of the pipe is given by $(100D+50D^2)$ where D is the diameter of the pipe in cm. The cost of the reservoir decreases with an increase in the quantity of fluid handled and is given by 20/Q where Q is the rate at which the fluid is handled (cubic meters per second). The pumping cost is given by $(300Q^2/D^5)$. Find the optimal size of the pipe and the amount of fluid handled for minimum overall cost.
d. Explain Fletcher reeves method.
e. What is dynamic programming? Write it's application.

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

(a) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_1^2$ with starting point (0,0) using univariate method.
(b) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_1^2$ from the starting point $X_1=\{0\}$ using Powell's method

4. Attempt any *one* part of the following: **7 x 1 = 7**

(a) Show that DFP (DAVIDON-FLETCHER-POWELL) method is a conjugate gradient method.

(b) Minimize $4x_1^2+3x_2^2-5x_1x_2-8x_1$ starting from point(0,0) using powell's method. Perform four iteration.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Minimize $4x_1^2+3x_2^2-5x_1x_2-8x_1$ starting from point(0,0) using powell's method. Perform four iteration.

(b) It has been decided to shift grain from a warehouse to a factory in an open rectangular box of length x_1 meters, width x_2 meters and height x_3 meters. The bottom sides and the ends of the box cost, respectively Rs 80, Rs 10 & Rs 20 /m^2. It costs Rs 1 for each round trip of the box. Assuming that the box will have no salvage value, find the minimum cost of transporting 80 m^3 of grain.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Max $Z = -x_1 + 4x_2$ Subject to $-10\ x_1 + 20\ x_2 \leq 22$ $5\ x_1 + 10\ x_2 \leq 49$ $x_1 \leq 5$ & $x_i \geq 0$, x_i's are integers using the branch and bound method

(b) Solve the following all integer programming problem using the branch and bound method

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) Solve the following integer programming problem using Gomory's cutting plane algorithm.
Maximize $Z= X_1+ X_2$ Subject to the constraints **(i)** $3X_1+2X_2\leq5$, (ii) $X_2\leq2$ and $X_1, X_2\geq0$ and are integers

(b) Maximize $Z= 2X_1+3X_2$ Subject to the constraint (i) $6X_1+5X_2\leq25$ (ii) $X_1+3X_2\leq10$ and $X_1, X_2\geq0$ and integers.