(b) Using Golden Section search method find the minimum point with the three decimal places of accuracy taking initial point $x^{(0)} = 0$ and an initial $\Delta = 1$; $f(x) = e^x - 400x^3 + 10$.

8. (a) What do you understand by the non-traditional optimization algorithms ? Discuss any *one* of them in detail giving suitable example.

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AA82

M. Tech. EXAMINATION, 2020

(First Semester)

(B. Scheme) (Re-appear)

(ME)

MEM503B

NUMERICAL AND OPTIMIZATION METHODS

Time : 2½ Hours] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Four* questions in all. All questions carry equal marks.

1. (a) Describe the various types of errors encountered in a numerical process.

(b) What do you mean by numerical instability ? Explain with suitable examples.

2. (a) List different standard forms of the polynomials that could be used for constructing interpolation functions.

(b) Fit the power equation $y = ax^b$ to the following data :

x	:	7.5	10	12.5	15	17.5	20
y	:	2.4	1.6	1.2	0.8	0.6	0.6

3. Estimate approximate first derivative of $\ln(1 + x^2)$ at $x = 1$ with $h = 0.01$, using :

(i) first-order forward difference formula

(ii) second order central difference formula.

4. (a) Explain the principle of Newton-Raphson formula with the help of graphical illustration.

(b) Solve the following sets of equations by Gauss-Siedel method :

$2x + y + 3z = 7$; $4x + 2y + 3z = 4$; $x - y + z = 0$.

5. (a) State the formula of Euler's method. Illustrate its concept graphically.

(b) Use 4th order Runge-Kutta method to estimate $y(0.5)$ of the following differential with $h = 0.25$:

$$\frac{dy}{dx} = \sin x + y;\ y(0) = 2$$

6. Given the boundary-value problem :

$$\frac{d^2y}{dx^2} = 3x + 4y;\ y(0) = 1;\ y(1) = 1$$

Obtain its solution in the range $0 \le x \le 1$ with $\Delta x = 0.25$ using a suitable numerical methods.

7. (a) State the fundamental rules for Region-elimination methods for Single-variable optimization.