B.E. METALLURGICAL AND MATERIAL ENGINEERING

SECOND YEAR

SECOND SEMESTER EXAM 2017

NUMERICAL ANALYSIS

Time : Three hours Full Marks : 100

Answer any *five* questions.

1. a. Write the algorithm for Lagrange interpolation formula. What are the advantages and disadvantages of Lagrangian Interpolation formula?
   b. Evaluate the value of $f(2)$ using Lagrangian interpolation formula from the following table:

X	0	1.2	2.5	4	5.1
$f(x)$	3	6.84	14.25	27	39.21

(6+4)+10=20

2. Distinguish between bracketing and non-bracketing method. Describe the secant method. Use the Newton-Raphson method to find the smallest positive root of the following equation, corrected upto 3 decimal point:

$X^3-5x+3=0$ 4+6+10=20

3. Show that the error of the composite trapezoidal rule is $O(h^2)$. Compute the trapezoidal approximation for M=20, 40, 80 and 160 for $\int_{0.25}^{4} \frac{1}{\sqrt{x}}\,dx$. 8+12=20

4. Compare global and local discretization errors for Euler's method. Write the algorithm of Euler method to solve general I.V.P. problem. Given y'=(y-x)/(y+x) with y=1 for x=0. Estimate y(0.1) using Euler's method. H=0.02. 4+6+10=20

5. Describe three different types of partial differential equations. Derive the difference equation for the heat equation as a parabolic P.D.E with grid. Define Lipscitz constant. 6+10+4=20

6. Define pivot element. Write the Algorithm for Gauss-Seidal iteration method. Solve the system by Gauss-Jordan Ellimination method: 3+7+10=20

$$X+5y+3z=10$$
$$X+3y+2z=5$$
$$2x+4y-6z=-4$$

7. Write down short notes on the following 2 methods -
   a. Jacobi iteration method
   b. Regula-Falsi method. 10+10=20

8. What are different types of errors that may occur in numerical calculations? What are the two common measures of accuracy? Find the inverse of the following matrix: 6+4+10=20

$$\begin{bmatrix} 1 & 5 & 3 \\ 1 & 3 & 2 \\ 2 & 4 & -6 \end{bmatrix}$$

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