B.E. METALLURGICAL AND MATERIAL ENGINEERING SECOND YEAR SECOND SEMESTER - 2018

NUMERICAL ANALYSIS

Time: 3 hours **Full Marks: 100**

Answer Question No. 1 and any four from the rest
Answer all the parts of a question in contiguous location

1. Answer all the question:

i. What is iterative method? What is non-linear equation? (2+1)

ii. Convert Decimal-to-Binary and Hexa-decimal: (2)
$(14.875)_{10}$

iii. Describes the different types of error in numbers? (5)

Compare the following: (2x5)

iv. Newton-Raphson method and Secant method for solving non-linear equations.

v. Iterative method and direct method for solving linear simultaneous equations.

2. 2x10

i. Find the real root of the following equation by Newton-Raphson method, correct upto 4-Decimal places.

$$x^3 - 3x + 1 = 0$$

ii. Find the real root of the following equation by Regular-Falsi method, correct upto 4-Decimal places.

$$xe^x = \cos x$$

3. 2x10

i. Solve the Langrage Interpolation formulae. For the following table of values, find out $f(9)$ (use appropriate formula):

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

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ii. Solve the following equations by Gauss-seidal method (show all the steps clearly):

$$\begin{aligned} 83x + 11y - 4z &= 95 \\ 7x + 52y + 13z &= 104 \\ 3x + 8y + 29z &= 71 \end{aligned}$$

4. 2x10

i. Solve the following equation by Gauss-elimination method:

$$\begin{aligned} 2x - y + 3z &= 9 \\ x + y + z &= 6 \\ x - y + z &= 2 \end{aligned}$$

ii. Find the real root of the following equation by Bi-section method, correct upto 3-Decimal places.

$x^3 - x - 4 \;=\; 0$

5. 2x10

i. Find $\frac{dy}{dx}$ at x=1.5 from following table by forward differences:

x	1.5	2.0	2.5	3.0	3.5	4.0
Y	3.375	7.0	13.625	24	38.875	59

ii. Find the real root of the following equation by secant method, correct upto 4-Decimal places.

$x^3 - x - 1 \;=\; 0$

6. 2x10

i. Evaluate $\int_a^b \frac{dx}{1+x^2}$ by using simpson 1/3 rule.

ii. Find y(2.2) using Euler's method from the equation

$\frac{dy}{dx} \;=\; -xy^2$ with y(2) = 1.