CAMBRIDGE INSTITUTE OF TECHNOLOGY

K R Puram, Bangalore – 560036

QUESTION BANK

Course: Engineering Mathematics II for CSE/EE/CV& ME stream Semester: II

Course Code: 23MAS201/ 23MAE201/23MAM201

NUMERICAL METHODS-1

Regula Falsi Method

1. Find the real root of the equation $\tan x + \tanh x = 0$ which lies between (2, 3) by using Regula-Falsi Method.
2. Find the real root of the equation $x^3 - 2x - 5 = 0$ which lies between (2, 3) by using Regula-Falsi Method.
3. Find the real root of the equation $x \log_{10}^{x} - 1.2 = 0$ which lies between (2, 3) by using Regula-Falsi Method.
4. Find the real root of the equation $\cos x = 3x - 1$ which lies between (0, 1) by using Regula-Falsi Method.
5. Find the real root of the equation $x^3 - 4x - 9 = 0$ which lies between (2, 3) by using Regula-Falsi Method.
6. Find the real root of the equation $x^3 - 3x + 4 = 0$ which lies between (-3, -2) by using Regula-Falsi Method.

Newton-Raphson Method

7. Find the root of the equation $x \sin x + \cos x = 0$ nearer to π, carry out three iterations up to 4 decimal places using Newton- Raphson Method.
8. Find the root of the equation $x^3 + 5x - 11 = 0$ nearer to 1.5, carry out four iterations up to 4 decimal places using Newton- Raphson Method
9. Find the root of the equation $x e^x - 2 = 0$ nearer to 1, carry out four iterations up to 4 decimal places using Newton- Raphson Method
10. Find the root of the equation $\tan x = x$ nearer to 4.5, carry out four iterations up to 4 decimal places using Newton- Raphson Method

Newton's Forward and Backward interpolation

11. Find $y(1.4)$ using Newton's Forward interpolating formula

x	1	2	3	4	5
$y = f(x)$	10	26	58	112	194

12. Find the value of $f(38)$ and $f(85)$ using suitable interpolation formulae

x	40	50	60	70	80	90
$y = f(x)$	184	204	226	250	276	304

13. Fit an interpolating polynomial $f(x)$ satisfying $f(0) = 0,\ f(2) = 4, f(4) = 56,\ f(6) = 204,\ f(8) = 496, f(10) = 980$ and hence find $f(3)$, $f(5)$.

14. From the following table estimate the number of students who have obtained the marks between 40 and 45

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

15. Estimate the probable number of persons in the age group 20 to 25 from the following data

Income per day (Rs.)	Under 10	10-20	20-30	30-40	40-50
Number of persons	20	45	115	210	115

Newton's Divided Difference

16. Find $f(4)$ using Newton's divided difference formula

x	0	2	3	6
$f(x)$	–4	2	14	158

17. Using Newton's divided difference interpolation formula, find the interpolating polynomial

x	2	4	5	6	8	10

y	10	96	196	350	868	1746

18. Using Newton's divided difference interpolation formula, find the interpolating polynomial

x	0	1	2	3	4	5
$f(x)$	3	2	7	24	59	118

19. Find $f(9)$ using Newton's divided difference formula

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

20. Fit an interpolating formula for the data $u_{10} = 355 \;\; u_0 = -5 \;\; u_8 = -21 \;\; u_1 = -14 \;\; u_4 = -125$.

Lagrange's Interpolation

21. If $y(0) = -12, y(1) = 0, y(3) = 6$ and $y(4) = 12,$ find the Lagrange's interpolation polynomial and estimate y at x = 2.

22. Use Lagrange's interpolation to fit a polynomial for the following data.

x	1	3	4	6
$f(x)$	3	9	30	132

Simpson's $\left(\frac{1}{3}\right)^{rd}$ and Simpson's $\left(\frac{3}{8}\right)^{th}$ Rules

23. Evaluate $\int_0^1 \frac{1}{1+x} dx$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by taking 6-equal strips and hence find $\log_e 2$.

24. Evaluate $\int_0^{0.3} \sqrt{1-8x^3}\, dx$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by taking 7 ordinates

25. Evaluate $\int_0^5 \frac{dx}{4x+5}$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by taking 10-equal parts and hence find $\log_e 5$

26. Evaluate $\int_0^1 \frac{1}{1+x} dx$ by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by taking 6-equal strips and hence find $\log_e 2$.

27. Evaluate $\int_0^6 \frac{1}{1+x^2}dx$ using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule divide the interval into 6 equal parts.

28. Evaluate $\int_1^4 e^{1/x}dx$ by Simpson's $\left(\frac{3}{8}\right)^{th}$ rule divide the interval into 6 equal parts.

29. Evaluate $\int_0^1 \frac{1}{1+x^2}dx$ by Simpson's $\left(\frac{3}{8}\right)^{th}$ rule divide the interval into 6 equal parts and hence find an approximate value of π.

Trapezoidal Rule

30. Evaluate $\int_0^1 \frac{1}{1+x}dx$ by Trapezoidal rule by taking 6-equal strips and hence find $\log_e 2$.

31. Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\cos\theta}\,d\theta$ by Trapezoidal rule by taking 6-equal strips.

32. Evaluate $\int_0^1 e^{-x^2}dx$ by Trapezoidal rule by taking 6-equal strips.