



Department of Applied Science MMMUT, Gorakhpur

B. Tech. Third Semester (2016 – 17)

1. Perform five iterations of Bisection method to obtain the positive real root of the equation  
$$f(x) = x^3 - 5x + 1 = 0$$
2. Find a real root of the equation  $3x + \sin x - e^x = 0$  by False Position method correct to four decimal places.
3. Determine the root of  $xe^x - 2 = 0$  by Regula Falsi method.
4. Find the value of  $(17)^{\frac{1}{3}}$  correct to four decimal places by Newton Raphson method.
5. Find the order of convergence of Newton Raphson method.
6. Solve the following system of equations by Gauss Elimination method  
$$2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16.$$
7. Solve the following system of equations by Crout's method  
$$10x + y + z = 12, 2x + 10y + z = 13, 2x + 2y + 10z = 14.$$
8. Solve the following system of equations using Jacobi's method  
$$5x - y + z = 10, 2x + 4y = 12, x + y + 5z = -1.$$
9. Solve the following system of equations using Gauss-Seidel method  
$$27x + 6y - z = 85, 6x + 15y - 2z = 72, x + y + 54z = 110.$$
10. Apply Gauss Jordan method to solve:  
$$x + 2y + z = 8, 2x + 3y + 4z = 20, 3x + 3y + 2z = 16.$$
11. Prove that  $\Delta \log f(x) = \log \left[ 1 + \frac{\Delta f(x)}{f(x)} \right]$  and  $(1 + \Delta)(1 - \nabla) = 1$ .
12. Evaluate  $\Delta^n [\cos(ax + b)]$ .
13. Obtain the missing terms in the following table:  

$x$ :	2.0	2.1	2.2	2.3	2.4	2.5	2.6
$f(x)$ :	0.135	?	0.111	0.100	?	0.080	0.074
14. The following table gives the marks obtained by 100 students in a subject  

Range of marks :	30-40	40-50	50-60	60-70	70-80
No. of students:	25	35	22	11	7

Use Newton's Forward Difference formula to find the number of students who obtained less than 55 marks.
15. Find the cubic polynomial which takes the following values:  

$x$ :	0	1	2	3
$f(x)$ :	1	2	1	10
16. The population of a town is as follows:  

Year	: 1921	1931	1941	1951	1961	1971
Population(lakhs) :	20	24	29	36	46	51

Estimate the increase in population during the period 1955 to 1961.
17. Find the polynomial  $f(x)$  of the lowest possible degree which assumes the values 3, 12, 15, -21 when  $x$  has the values 3, 2, 1, -1 respectively.
18. Given  $\log_{10} 654 = 2.8156$ ,  $\log_{10} 658 = 2.8182$ ,  $\log_{10} 659 = 2.8189$  and  $\log_{10} 661 = 2.8202$ , find the value of  $\log_{10} 656$  by Newton's Divided Difference formula.



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19. Using Lagrange's method of interpolation find the polynomial  $f(x)$  of degree 2 such that

$$f(1) = 1 \quad ; \quad f(3) = 27 \quad ; \quad f(4) = 64.$$

20. Find the value of  $\int_1^5 \log_{10} x dx$  taking 8 subintervals correct to four decimal places by Trapezoidal rule.

21. Evaluate  $\log_e 7$  by Simpson's Three-Eighth rule.

22. The velocity of a train which starts from rest is given by the following table, the time being

Reckoned in minutes from the start and the speed in km/hr

T(min.) : 2      4      6      8      10      12      14      16      18      20

V(km/hr): 1628.8   40   46.4   51.2   32   17.6   8   3.2   0

Approximate the total distance run in 20 minutes.

23. Evaluate  $\int_4^{5.2} \log_e x dx$  by Simpson's One-Third rule as well as by Simpson's Three-Eighth rule.

24. Given  $\frac{dy}{dx} = x^3 + y$  ;  $y(0)=1$  , find  $f(0.02)$  by Euler's Method taking  $h=0.01$ .

25. Use Picard's method to approximate the value of  $y$  when  $x=0.1, 0.2, 0.3, 0.4$  and  $0.5$ , given that

$Y=1$  at  $x=0$  and  $\frac{dy}{dx}=1+xy$  correct to three decimal places.

26. Use Picard's method to find estimate values of  $y$  and  $z$  at  $x=0.1$ . Given that  $y(0)=2$  ,  $z(0)=1$  and

$$\frac{dy}{dx} = x + z, \quad \frac{dz}{dx} = x - y^2$$

27. Use Runge-Kutta method of fourth order to find an approximate value of  $y$  for  $x=0.2$  in steps

of 0.1 if  $\frac{dy}{dx} = x + y^2$  with  $y(0)=1$ .

28. Using Runge-Kutta method of fourth order solve  $\frac{dy}{dx} = yz + x$  ,  $\frac{dz}{dx} = xz + y$  given that  $y(0)=1$  ;

$z(0)=-1$  for  $y(0.2)$  ,  $z(0.2)$

29. Solve  $\frac{dy}{dx}=(x+y)y$  ,  $y(0)=1$  using Milne's Predictor-Corrector method for  $y(0.4)$ .



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30. Solve the following differential equation and obtain  $y(0.2)$  using Adams-Bashforth Predictor and

Adam's- Moulton Corrector method  $\frac{dy}{dx} = x^2 - y + 1$ ,  $0 \leq x \leq 1$  with  $y(0)=1$ . Use  $h=0.1$  and

Obtain the answer to an accuracy of 6 digits.

31. Given  $f(x)=\sin x$ , construct the Taylor's Series approximations of order 0 to 7 at  $x=\frac{\pi}{3}$  and state their absolute error.

32. Evaluate the sum  $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$  to 4 significant digits and find its absolute and relative error.

33. The population of a certain town as obtained from census data, is shown in the table below:

Year :	1951	1961	1971	1981	1991
Popu.(thousands) :	19.96	36.65	58.81	77.21	94.61

Find the rate of growth of population in the year 1981.

34. Given the following data, find the maximum value of  $y$

X: -1      1      2      3

Y: -21    15    12    3.

35. A curve is drawn to pass through the following points:

X: 1    1.5    2    2.5    3    3.5    4

Y: 2    2.4    2.7    2.8    3    2.6    2.1

Estimate the area bounded by the curve, x-axis and lines  $x=1$  and  $x=4$ .