

## Tutorial Sheet

### Applied Mathematics IV (MATH242)

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Branch: CSE, EEE, CE, ECE, ME,

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Semester: Fourth.

1. Find a real root of the equation  $3x + \sin x - e^x = 0$  by the method of false position correct four decimal places. Choose suitable initial approximations.
2. Derive Newton Raphson Method, Using Newton- Raphson method, find real root of the equations  
(I)  $3x = \cos x + 1$  (II)  $x \log_{10} x = 1.2$  correct to four decimal places.
3. Solving the following system of equations using Gauss-Seidel iterative method:  
Perform four iteration  
 $2x + 10y + z = 51,$        $10x + y + 2z = 44,$        $x + 2y + 10z = 61,$
4. Perform five iterations of the Bisection method to obtain the smallest positive root of the equation  $x^3 - 5x + 1 = 0$ .
5. Find a real root of  $2x - \log_{10} x = 7$  correct to three decimal places using iteration method.
6. Solving the following system of equations using Jacobi iteration method:  
Perform four iteration  
 $5x - y + z = 12,$        $2x + 4y = 12,$        $x + y + 5z = -1,$

7. The following table gives the population of a town during the last six censuses. Estimate the population in 1913 by Newton's forward difference formula

Year	1911	1921	1931	1941	1951	1961
Population(in thousands)	12	15	20	27	39	52

8. Given the values:

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

Evaluate  $f(8)$  using: Lagrange's formula.

9. Find the interpolating polynomial for the following:

x	0	1	2	5
F(x)	2	3	12	147

10. Given the values

x	0	2	3	6
F(x)	-4	2	14	158

Find the values of  $f(4)$  using Lagrange's formula.

11. Solve the following system: by JACOBI'S Method correct to two places of decimal

(a)  $10x + 2y + z = 9$ ,  $2x + 20y - 2z = -44$ ,  $-2x + 3y + 10z = 22$

(b)  $23x + 13y + 3z = 29$ ,  $5x + 23y + 7z = 37$ ,  $11x + y + 23z = 43$

12. Solve the following system: by Gauss-Seidel method correct to two places of decimal

(a)  $27X+6Y-Z=85$ ,  $6X+15Y+2Z=72$ ,  $X+Y+54Z=110$

(b)  $10x+2y+z=9$ ,  $2x+20y-2z=-44$ ,  $-2x+3y+10z=22$

13. Using Newton's divided difference formula to find the interpolating polynomial and hence evaluate  $f(19.5)$

x	1	3	5	7	11
f(x)	5	11	17	23	29

14. Using Newton's divided difference formula to find the interpolating polynomial and hence evaluate  $f(5)$

x	3	7	9	10
f(x)	168	120	72	63

OR

15. Using Newton's divided difference formula to find the interpolating polynomial and hence evaluate  $f(9.5)$

x	7	8	9	10
f(x)	3	1	1	9

16. Using Newton's divided difference formula to find the interpolating polynomial and hence evaluate  $f(8)$

X	1	3	5	8
f(x)	10	16	26	44

17. Using Newton – Raphson method, Ragula falsi method and Bisection method

Perform four/five iteration of the bisection method to obtain the smallest positive root of the equation

$$f(x) = x^3 - 5x + 1 = 0$$

$$f(x) = x^3 - x - 1 = 0$$

$$f(x) = x^3 - 2x - 1 = 0$$

$$f(x) = x^3 + 3x - 1 = 0$$

$$f(x) = x^3 - 2x - 5 = 0$$

$$f(x) = 3x^3 + 10x^2 + 10x + 7 = 0$$

18. Prove that  $\left(\frac{\Delta^2}{E}\right)e^x \left(\frac{Ee^x}{\Delta^2 e^x}\right) = e^x$  the interval of differencing being  $h$ .

19. By means of Newton's divided difference formula, find the value of  $f(8)$  and  $f(15)$  from the following table:

x	4	5	7	10	11	13
F(x)	48	100	294	900	1210	2028

20. Given the initial value problem:

$$\frac{dy}{dx} = 1 + y^2, y(0) = 0$$

Find  $y(0.6)$  by Runge – Kutta forth order method taking  $h = 0.2$ .

21. Using Newton – Raphson method, Ragula falsi method and Bisection method find the real root of the equation

$$3x = \cos x + 1 \text{ correct to four decimal places}$$

22. Evaluate,  $\int_0^1 \frac{dx}{1+x^2}$

(i) Simpson's (1/3) rule (ii) Simpson's (3/8) rule Hence obtain the approximate value of  $\pi$ , dividing the range into 6 equal parts.



$$\frac{dy}{dx} = 1 + y^2, y(0) = 0$$

23 . Given the initial value problem

find  $y(0.6)$  by Runge-Kutta fourth order method taking  $h = 0.2$ .

24. Using Picards's method of successive approximation, obtain a

solution upto fifth approximation of the equation  $\frac{dy}{dx} = y + x$  such that  $y = 1$  when  $x = 0$ .

25. A river is 80m wide. The depth  $y$  of the river at a distance  $x$  from one bank is given by the following table

x	0	10	20	30	40	50	60	70	80
y	0	4	7	9	12	15	14	8	3

Find the approximate area of cross-section of the river using Simpson's  $1/3^{\text{rd}}$  rule.

26. Find the number of men getting wages 10 Rs. from the following table:

Wages ( in Rs)	5	15	25	35
No. of men	9	30	35	42

27.

Given that

x	1	2	3	4	5
y	2	5	10	17	26

Find the value of  $\nabla^2 y_5$

28. Given that

x	1.0	1.1	1.2	1.3
y	0.841	0.891	0.932	0.963

find  $\frac{dy}{dx}$  at  $x = 1.0$

29. Use Newton-Raphson method

find the real root of the equation  $x^4 - x - 9 = 0$  by Newton Raphson method correct to three places of decimal.