

(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 20 21-2024 ONLY)

21UMS306

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS: DECEMBER- 2022
COURSE NAME: B.Sc.- MATHEMATICS (Aided) MAXIMUM MARKS: 70
SEMESTER: III TIME : 3 HOURS

PART – III
NUMERICAL TECHNIQUES

SECTION-A (10 X 01 = 10 MARKS)

ANSWER ALL THE QUESTIONS.

MULTIPLE CHOICE QUESTIONS.

K1

- Newton-Raphson method is also called _____.
a) method of slopes b) method of convergence c) method of tangents d) all of these
- In Newton's forward difference formula v is _____.
a) $\frac{x-x_0}{h}$ b) $\frac{x+x_0}{h}$ c) $\frac{x-x_0}{h^2}$ d) $\frac{x+x_0}{h^2}$
- Stirling's formula can be used to find the derivatives in the ----- of table values.
a) beginning b) centre c) end d) all the above
- The improved Euler's method is based on the average of _____.
a) points b) slopes c) curves d) all the above
- $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = F(x,y)$ is ----- equation.
a) Laplace b) Binomial c) Elliptic d) Poisson

ANSWER THE FOLLOWING IN ONE OR TWO SENTENCES. K2

- Write the formula for Regula-falsi method.
- Define Interpolation.
- Why is Trapezoidal rule so called?
- State the formula for K_2 in R-K method of second order.
- State the five point formula to solve $u_{xx} + u_{yy} = 0$.

SECTION- B (5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K3

- a) Using Newton's method, find the root between 0 and 1 of $x^3 = 6x-4$ correct to five Decimal places.

(OR)

- Solve by Gauss-Jordan method. $2x+y+4z=12$; $8x-3y+2z=20$; $4x+11y-z=33$.

- a) Solve the system of equations by Gauss-Seidal method
 $27x+6y-z=85$; $6x+15y+2z=72$; $x+y+54z=110$

(OR)

- Using Newton's forward interpolation formula, find the value of y when $x=21$ from the following tabulated values

X :	20	23	26	29
Y :	0.3420	0.3907	0.4384	0.4848

13. a) Find the first and second derivative of the function tabulated below at $x = 0.6$

X :	0.4	0.5	0.6	0.7	0.8
Y :	1.5836	1.7974	2.0442	2.3275	2.6511

(OR)

- b) Evaluate $\int_{-3}^3 x^4 dx$ by using (i) Trapezoidal and (ii) Simpson's rule. Verify your result by actual integration.
14. a) Using Taylor's series method, find y at $x = 0.1$ (0.1) 0.4 given $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$
Correct to four decimal places.

(OR)

- b) Obtain the values of y at $x = 0.1$ 0.2 using R-K method of second order for the differential equation $y' = -y$, given $y(0) = 1$
15. a) Explain briefly about Elliptic equation.
- b) Solve $\nabla^2 u = 8x^2y^2$ for square mesh given $u=0$ on the 4 boundaries dividing the square into 16 sub-squares of length 1 unit.

SECTION-C

(4 X10 = 40 MARKS)

ANSWER ANY FOUR OUT OF SIX QUESTIONS.

16 TH QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS FROM QUESTION NOS : 17 TO 21.

16. Find, by Gaussian elimination, the inverse of the matrix

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

17. Solve by Gauss-Jordan method and Gauss-elimination method.

$$2x + y + 4z = 12 ; 8x - 3y + 2z = 20 ; 4x + 11y - z = 33.$$

18. In the table below, estimate the missing value

X :	0	1	2	3	4
Y :	1	2	4	-	16

19. Dividing the range into 10 equal parts, find the approximate value of $\int_0^\pi \sin x dx$ by
(a) Trapezoidal rule (b) Simpson's rule.
20. Apply the fourth order Runge-kutta method, to find an approximate value of y
When $x = 0.2$, given that $y' = x + y$, $y(0) = 1$.
21. Solve the equation $\nabla^2 u = 0$ for the following mesh, with boundary values as shown
Using solution of Laplace's equation (Leibmann's iteration procedure).

	0	500	1000	500	0
1000		U_1	C	U_3	1000
			U_2		
2000		U_4	U_5	U_6	2000
1000	A	U_7	U_8	U_9 B	1000
		D			
	0	500	1000	500	