Total No. of Printed Pages: 2

SUBJECT CODE NO: - Y-2065
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. S.Y Sem-IV
Examination March / April - 2023
Mathematics MAT - 401 Numerical Methods

[Time: [1.30 Hours]   **[Max. Marks: 50]**

Please check whether you have got the right question paper.

N. B   1) Attempt all questions
                         2) Figure to the right indicate full marks
                         3) Use of non-Programmable calculator and logarithmic table is allowed

Q1   A) Attempt any one   08
        a) Explain the bisection method for finding real roots of an equation f(x)=0
        b) Derive Newton's forward difference interpolation formula

       B) Attempt any one   07
        c) Use the Newton-Raphson method to find a root of the equation
        $x^3 - 2x - 5 = 0$ which lies between 2 and 3

        d) Using Newton divided difference formula find f(x) as a polynomial in x. given
        data is

x	-1	0	3	6	7
f(x)	3	-6	39	822	1611

Q2   A) Attempt any one   08
        a) Explain the method of fitting a straight line $Y = a_o + a_1 x$
        b) Explain the method of factorization to solve the system of linear equations

       B) Attempt any one
        c) Determine the constant a and b by the method of least squares   07
           Such that $y = ae^{bx}$ fits the following data

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

        d) Solve the following system
           2x+y+z=10
           3x+2y+3z=18
           x+4y+9z=16
           By Gaussian elimination method

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Q3   A) Attempt any one   05
a) Explain Taylor's series method to solve the differential equation
$$y' = f(x, y)$$
$$with\ the\ initial\ condition\ y(xo) = y_o$$

b) With the usual notations prove that
$$\mu \equiv \left[1 + \frac{1}{4}\delta^2\right]^{\frac{1}{2}}$$

B) Attempt any one
c) Using Picard's method obtain the solution of   05
$$\frac{dy}{dx} - 1 = xy\ with\ y(0) = 1$$
And compute y(0.1) correct to four decimal places
d) Show that
$$e^x \left(u_o + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_o + \ - - - - -\right)$$
$$= u_0 + u_1 x + u_2\frac{x^2}{2!} + \ - - - - -$$

Q4 Choose the correct alternative   10
i)   Which of the following is transcendental equation?
a) $x^3 - x - 1 = 0$ b) $x^3 + x + 1 = 0$
c) $x^3 - 2x^2 + 1 = 0$ d) $xe^x + sinx = 0$

ii)   If δ is central difference operator then $\delta y_{\frac{3}{2}}$ = ------
a) $y_1 - y_o$ b) $y_2 - y_1$ c) $y_3 - y_2$ d) $y_4 - y_3$

iii)   If $y(x) = 2x^2 + x - 1$, then $\Delta^3 y(x)$ is ----
a) 0   b) 1   c) 2   d) 3

iv)   The chebyshev polynomial of degree two is ------
a) 1   b) x   c) $2x^2 - 1$ d) $2x^2 + 1$

v)   If $A = \begin{bmatrix} 1 & 0 \\ 0 & -2 \end{bmatrix}$ then the characteristic polynomial is -------
a) $\lambda^2 + \lambda - 2$ b) $\lambda^2 - \lambda + 2$ c) $\lambda^2 + 2\lambda + 1$ d) $\lambda^2 - 2\lambda - 1$