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SUBJECT CODE NO: - 2065 FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. S.Y (Sem-IV)

Mathematics MAT - 401 Numerical Methods

[Time: 1:53 Hours] [Max. Marks:50]

Please check whether you have got the right question paper.

N.B

- 1. Attempt all questions.
- 2. Figures to the right indicate marks.
- 3. Use of non-programmable calculator and logarithmic table is allowed.
- Q.1 A) Attempt any one.

08

- a) Explain the method of false position for finding real roots of an equation f(x) = 0.
- b) Derive Larange's interpolation formula.
- B) Attempt any one

07

- c) Obtain a root, correct to four decimal places, which lies between 2 and 3 of the equation $x^3 4x 9 = 0$, using bisection method.
- d) The populations for town in decennial census were as under. Estimate the population for the year 1955.

Year	1921	1931	1941	1951	1961
Population (in thousands)	46	66	81	93	101

Q.2 A) Attempt any one.

08

a) Prove that

$$\int_{-1}^{1} \frac{T_m(x) T_n(x)}{\sqrt{1-x^2}} dx = \begin{cases} 0, & m \neq n \\ \frac{\pi}{2}, & m = n \neq 0 \\ \pi, & m = n = 0 \end{cases}$$

Where, $T_n(x)$ is chebyshev polynomial of degree n.

- b) Explain the Gauss Jordan method for solving system of linear equations.
- B) Attempt any one.
 - c) Fit a polynomial of the second degree to the data points given in the following table. 07
 - x
 0
 1.0
 2.0

 y
 1.0
 6.0
 17.0
 - d) Prove that, the degree in satisfies the differential equation $(1 x^2) \frac{d^2y}{dx^2} x \frac{dy}{dx} + n^2y = 0$

Q.3 A) Attempt any one 05

- a) Explain Eular's method to solve the differential equation y' = f(x, y) with the initial condition $y(x_0) = y_0$.
- b) With the usual notations, prove that $\mu = \sqrt{1 + \frac{1}{4}\delta^2}$
- B) Attempt any one

05

- c) From the Taylor series for y(x), find y(0.1) correct to four decimal places if y(x)satisfies $y' = x - y^2$ and y(0) = 1
- d) With the usual notations, prove that
 - $\nabla \equiv 1 E^{-1}$ i)
 - $\delta \equiv E^{1/2} E^{-1/2}$ ii)
- Q.4 Choose the correct alternative.

10

- The rate of convergence of Newton Raphson method is i)
 - a) Linear

b) Quadratic

c) Cubic

- Bi- quadratic
- $\Delta^2 y_0 = \underline{\hspace{1cm}}$ ii)
 - a) $y_2 2y_1 + y_0$
- b) $y_3 + 2y_2 + y_1$ d) $y_2 + 2y_1 + y_0$
- c) $y_3 2y_2 + y_1$
- The Chebyshev polynomial of degree zero is $\frac{1}{2x^2-1}$ iii)

- d) $2x^2 + 1$
- If 1, 2, -3 are eigen values of a matrix A then the spectral radius of A is ~ 1 b)
 - a)

- -3d)
- Which of the following symbolic relation is not true? V)
- a) $\Delta \equiv E 1$ b) $\Delta \equiv \nabla E$ c) $\delta \equiv E^{1/2} E^{-1/2}$ d) $\Delta \equiv E + 1$