

This question paper contains 3 printed pages]

SB—129—2022

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MAY/JUNE, 2022

(CBCS/New Pattern)

MATHEMATICS

Paper XIV

(Numerical Analysis)

(Monday, 20-6-2022)

Time : 10.00 a.m. to 12.30 p.m.

Time— 2.30 Hours

Maximum Marks—40

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Use of non-programmable calculator is allowed.

1. Prove that the Newton-Gregory formula for Backward Interpolation and hence estimate the population for the year 1975. 15

Year x	Population y
1941	46
1951	67
1961	83
1971	95
1981	102

P.T.O.

Or

- (A) Prove that the n^{th} divided differences of a polynomial of the n^{th} degree are constant. 8
- (B) Given $\log_{10} 654 = 2.8156$, $\log_{10} 658 = 2.8182$, $\log_{10} 659 = 2.8189$, $\log_{10} 661 = 2.8202$. Find $\log_{10} 656$. 7
2. Derive the formula for Gauss's forward formula for equal intervals, and hence find the value of y when $x = 3.75$, given the following table : 15

x	y_x
2.5	24.145
3.0	22.043
3.5	20.225
4.0	18.644
4.5	17.262
5.0	16.047

Or

- (A) Derive the formula for Trapezoidal Rule by using a general quadrature formula for Equidistant Ordinates. 8
- (B) Given : 7

$$\frac{dy}{dx} = \frac{y - x}{y + x}$$

with the boundary condition $y = 1$ for $x = 0$, find approximately for $x = 0.1$ by Euler's method (Five steps).

3. Attempt any *two* of the four (each of 5 marks) : 10

(A) Prove that :

$$e^x = \left(\frac{\Delta^2}{E} \right) \cdot e^x \cdot \frac{Ee^x}{D^2 e^x}$$

(B) Find the third divided difference with arguments 2, 4, 9, 10 of the function $f(x) = x^3 - 2x$.

(C) Derive the Stirling's interpolation formula.

(D) Explain the Euler's modified method.