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V—41—2017

FACULTY OF ARTS/SCIENCE

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

OCTOBER/NOVEMBER, 2017

MATHEMATICS

Paper XVI (MT-304)

(Numerical Analysis)

(Thursday, 12-10-2017) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

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

(*ii*) Figures to the right indicate full marks.

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

1. Attempt any *five* of the following : 2 each

(*a*) Evaluate Δe^{ax+b}; interval of differencing being unity.

(*b*) Define shift operator E and backward operator ∇.

(*c*) Prove that :

$$\mu^2 = 1 + \frac{1}{4}\delta^2.$$

(*d*) Prove that :

$$\delta = 2\sin\frac{U}{2}.$$

(*e*) Define numerical differentiation.

(*f*) Define initial value problem and boundary value problem of differential equation.

2. Attempt any *two* of the following : 5 each

(*a*) Prove that the *n*th differences of a rational integral function (polynomial) of the *n*th degree are constant when the values of the independent variables are at equal intervals.

P.T.O.

(*b*) Estimate the population for the year 1975. The population of a country in the decennial census were as under :

Year x	**Population (in lakhs)** y
1941	46
1951	67
1961	83
1971	95
1981	102

(*c*) Evaluate :

$$\frac{\Delta^2 x^3}{E x^2}.$$

3. Attempt any *two* of the following : 5 each

(*a*) Prove that Gauss's forward formula for equal intervals.

(*b*) Prove that Lagrange's interpolation formula for unequal intervals.

(*c*) By means of Newton's divided difference formula, find $f(8)$ from the following table :

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

4. Attempt any *two* of the following : 5 each

(*a*) Prove that the general quadrature formula for equidistant ordinates.

(*b*) Evaluate :

$$\int_{-3}^{3} x^4 \, dx$$

by using Trapezoidal rule, take seven equidistant ordinates.

(*c*) Given :

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

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