# AO—41—2018

## FACULTY OF ARTS/SCIENCE

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

### MARCH/APRIL, 2018

MATHEMATICS

Paper XVI (MT-304)

(Numerical Analysis)

**(Wednesday, 21-3-2018)**                                   **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-programmable calculator is allowed.

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

(*a*)   Prove that :

$$E\Delta = \Delta E.$$

(*b*)   Define the third divided difference of $f(x)$ for arguments $x_0$, $x_1$, $x_2$, $x_3$.

(*c*)   Prove that :

$$\delta = \Delta E^{-\frac{1}{2}}.$$

(*d*)   Define difference product of $x_1$, $x_2$, $x_3$ in terms of determinants.

(*e*)   Define numerical quadrature.

(*f*)   State Wedddle's Rule as approximate quadrature formula.

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

(*a*)   Prove that the divided difference are symmetrical in all their arguments, that is, the value of any divided difference is independent of the order of the arguments.

P.T.O.

(*b*) Find :

$$\Delta^5 u_0.$$

Given :

$u_0 = 3,\ u_1 = 12,\ u_2 = 81,\ u_3 = 200,$

$u_4 = 100,\ u_5 = 8.$

(*c*) Find the number of students who obtained less than 45 marks, from the following table :

| Marks | No. of Students |
| --- | --- |
| 30—40 | 31 |
| 40—50 | 42 |
| 50—60 | 51 |
| 60—70 | 35 |
| 70—80 | 31 |

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

(*a*) Prove the Newton's divided difference interpolation formula for unequal intervals.

(*b*) Prove the Bessel's interpolation formula.

(*c*) Find $y_{35}$ using Stirling's formula. Given :

$$y_{20} = 512,\ y_{30} = 439,\ y_{40} = 346,\ y_{50} = 243.$$

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

(*a*) Explain Euler's modified method to solve differential equation of the first order :

$$\frac{dy}{dx} = f(x,\ y).$$

(*b*) Evaluate $I = \int_{4}^{5.2} \log_e x \, dx$ by using Weddle's rule :

| *x* | $\log_e x$ |
|------|------------|
| 4.0 | 1.38629463 |
| 4.2 | 1.43508453 |
| 4.4 | 1.84160454 |
| 4.6 | 1.52605630 |
| 4.8 | 1.56861592 |
| 5.0 | 1.60943791 |
| 5.2 | 1.64865863 |

(*c*) Evaluate $\int_{0}^{4} e^x \, dx$ by using Simpson's $\dfrac{3}{8}$th rule. Given :

$$e^0 = 1, \ e^1 = 2.72, \ e^2 = 7.39, \ e^3 = 20.09,$$

$$e^4 = 54.60.$$