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W—44—2018

FACULTY OF ARTS/SCIENCE

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

OCTOBER/NOVEMBER, 2018

MATHEMATICS

Paper XVI (MT-304)

(Numerical Analysis)

(Friday, 12-10-2018) **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-scientific/Non-programmable calculator is allowed.

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

(*i*) If :

$$f(x) = ax^n + bx^{n-1} + cx^{n-2} + \ldots + kx + 1$$

find $\Delta f(x)$.

(*ii*) Prove that :

$$E^2 = (1 + \Delta)^2.$$

(*iii*) Define central difference operator δ and mean operator μ.

(*iv*) Prove that :

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

(*v*) State general quadrature formula for equidistant ordinate.

(*vi*) State Weddel's rule as approximate quadrature formula.

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

(*i*) Prove that the *n*th divided difference of a polynomial of the *n*th degree are constant.

P.T.O.

(*ii*) Construct a difference table from the following values of x and y :

x	y
3.0	.33333
3.1	.32258
3.2	.31250
3.3	.30303
3.4	.29412

(*iii*) From the following table, find the number of students who obtained less than 45 marks :

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

(*i*) Prove that Bessel's Interpolation formula for equal intervals.

(*ii*) Given $\log_{10}{}^{654} = 2.8156$, $\log_{10}{}^{658} = 2.8182$, $\log_{10}{}^{659} = 2.8189$, $\log_{10}{}^{661} = 2.8202$. Find $\log_{10}{}^{656}$.

(*iii*) Use Stirling's formula to find y_{35} given $y_{20} = 512$, $y_{30} = 439$, $y_{40} = 346$, $y_{50} = 243$.

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

(*i*) Prove the Simpson's $\frac{3}{8}$th rule as approximate quadrature formula.

(*ii*) Calculate approximate value of $\int_0^{\frac{1}{2}\pi} \sin x\,dx$, by using Trapezoidal rule.

Given :

$\sin 0 = 0$, $\sin \pi/20 = 0.1564$,

$\sin \pi/10 = 0.3090$, $\sin 3\pi/20 = 0.4540$,

$\sin \pi/5 = 0.5878$, $\sin \pi/4 = 0.7071$,

$\sin 3\pi/10 = 0.8090$, $\sin \frac{7\pi}{20} = 0.8910$,

$\sin 2\pi/5 = 0.9511$, $\sin \frac{9\pi}{20} = 0.9877$,

$\sin \pi/2 = 1.0000$.

(*iii*) Using Euler's modified method, obtain solution of the equation :

$$\frac{dy}{dx} = x + |\sqrt{y}| = f(x, y)$$

with boundary condition $y = 1$ at $x = 0$ for the range $0 \leq x \leq 0.6$ in the steps of 0.2 (upto first, second, third approximations to y_1).