2103000203023002 / 2111000303023002
EXAMINATION FEBRUARY-MARCH 2024
BACHELOR OF SCIENCE (THIRD SEMESTER)
MTH-302 MATHEMATICS PAPER – VI

[Time: As Per Scheduled] **[Max. Marks: 50]**

Instructions:
1. Fill up strictly the following details on your answer book
   a. Name of the Examination : **BACHELOR OF SCIENCE (THIRD SEMESTER)**
   b. Name of the Subject : **MTH-302 MATHEMATICS PAPER - VI**
   c. Subject Code No : **2103000203023002 / 2111000303023002**
2. Sketch neat and labelled diagram wherever necessary.
3. Figures to the right indicate full marks of the question.
4. All questions are compulsory.
5. Follow usual notations.
6. Use of Scientific non-programmable calculator is allowed.
7. Total marks 50.

Seat No:

Student's Signature

Q.1 Answer any FIVE as directed. **10**

(1) What is an absolute error?
(2) Round-off the following numbers to the four significant digits: 0.0022218, 19.235101, 38.46235 and 81.255
(3) Find the interval in which the root of the equation $x + 1 = x^3$.
(4) Evaluate $\Delta(\tan^{-1} x)$.
(5) Prove that $\Delta^2 \equiv \delta^2 E$.
(6) Construct the forward difference table for the data: (11, 1.2), (12, 2.1), (13, 6.7) (14, 10.2) and (15, 14.6).
(7) Find the value of $E^2 x^2$, when the value of x vary by a constant increment one.
(8) Define interpolation.

Q.2 Attempt any TWO. **10**

(1) If $u = \frac{5xy^2}{z^3}$, then find the relative error when $\Delta x = \Delta y = \Delta z = 0.001$ and $x = y = z = 1$.

(2) Sum the numbers: 0.1532, 15.45, 0.000354, 305.1, 8.12, 143.3, 0.0212, 0.643 and 0.1734, where each number is correct to the digits given. Also estimate the absolute error in the sum.

(3) Three approximate values of the number $\frac{1}{3}$ are given as 0.30, 0.33 and 0.34. Which of these three is the best approximation?

Q.3 Attempt any TWO. **10**

(1) Explain 'Newton-Raphson Method' to obtain the real root of an equation $f(x) = 0$.

(2) Find a real root of the equation $x^3 - 2x - 5 = 0$, using 'Bisection Method' correct up to two decimal places.

(3) Find a real root of the equation $xtanx + 1 = 0$, using 'Method of false-position' correct up to three decimal places.

Q.4 Attempt any TWO. **10**

(1) Obtain the value of $\Delta^3\{(1+x)(1-3x)(1+5x)\}$; where $h = 1$.

(2) Prove that $\Delta^n u_{x-n} = u_x - nu_{x-1} + \frac{n(n-1)}{2}u_{x-2} - \cdots + (-1)^n u_{x-n}$.

(3) Show that (a) $\Delta - \frac{1}{2}\delta^2 \equiv \delta\sqrt{1+\frac{\delta^2}{4}}$; (b) $\Delta^r y_k = \nabla^r y_{k+r}$

Q.5 Attempt any TWO. **10**

(1) Derive following interpolation formula.
$y_n(x) = y_0 + p\Delta y_0 + \frac{p(p-1)}{2!}\Delta^2 y_0 + \frac{p(p-1)(p-2)}{3!}\Delta^3 y_0 + \cdots + \frac{p(p-1)\ldots(p-n+1)}{n!}\Delta^n y_0$

(2) Find $f(8)$ from the following data:

x	2.5	4.5	6.5	8.5
$f(x)$	24	120	336	720

(3) Using Gauss's formula, obtain $f(1.16)$;

x	1.0	1.05	1.1	1.15	1.20	1.25	1.30
$f(x)$	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

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