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B. Sc. (Non-Medical) (Semester – 6th)
NUMERICAL METHODS
Subject Code: BSNMD1631
Paper ID: 19131429

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) What do you mean that rate of convergence in quadratic?
b) Give two comparisons of Bisection Method & Newton's method.
c) Define Interpolation in four lines.
d) Evaluate $\Delta^3 y_2$
e) What is Gaussian integration?
f) Write the formulas of double Integration by Simpson's rules
g) Find $y(1)$ by Euler's method in two steps given that $\frac{dy}{dx} = x + y$, $y(0) = 5$.
h) State Newton divided difference formula for interpolation.
i) Explain briefly Picard's method.
j) Write the Predictor-correction formula of Adams-Bashforth method.

Section – B **(5 marks each)**

Q2. Find the root of the equation $x^3 - 4x - 9 = 0$ using Bisection method correct to 3 decimal places.

Q3. Find positive root of $x^4 - x = 10$ correct to 3 decimal places using Newton Raphson method.

Q4. Use Gauss-Seidel method to solve

$$2x + y + 6z = 9; 8x + 3y + 2z = 13; x + 5y + z = 7$$

Q5. Use LU decomposition method to solve

$$28x + 4y - z = 32; x + 3y + 10z = 24; 2x + 17y + 4z = 35$$

Q6. Find $y(1) where \frac{dy}{dx} = \frac{y-x}{y+x}$ by Milne's method given that $y(0) = 1$.

Section – C **(10 marks each)**

Q7. (a) Prove the following table, estimate the number of students who obtained marks between 40 and 45.

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

(b) Find $y(10)$ where:

X	5	6	9	11
Y	12	13	14	16

Q8. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using (i) Trapezoidal rule (ii) Simpson's rule

(b) Derive the formula for $\left(\frac{dy}{dx}\right) at\ x = x_0$ using Newton forward interpolation formula.

Q9. Using Runge-Kutta method of 4th order solve

$\frac{dy}{dx} = \frac{y^2-x^2}{x^2+y^2}$ with $y(0) = 1$ at $x = 0.2$.