9-12-16

DOON UNIVERSITY, DEHRADUN

End Semester Examination, 2016-17

School of Technology

Integrated M.C.A. (Semester III)

Course: STM – 518 Computer Based Numerical and Statistical Techniques

Time Allowed: 3Hours *Maximum Marks: 50*

SECTION A **(10 Marks)**

1. What is the necessary condition of Simpson's 3/8 rule? **[1]**
2. What is the problem with Lagrange's interpolation? **[1]**
3. How many roots can be obtained by bisection method in a given interval? Explain why it is so. **[1]**
4. What is the difference between Gauss's elimination method and Gauss-Jorden's elimination method? **[1]**
5. What is the role of step size 'h' in predictor-corrector method? **[1]**
6. What is the percentage error? What is the requirement to estimate percentage error in any calculation? **[1]**
7. Find the inverse of following matrix using Gauss-Jorden method: **[2]**

$$\begin{bmatrix} 5 & 2 \\ 3 & -1 \end{bmatrix}$$

OR

Explain with an example how error gets propagated in successive calculations.

8. Find $\Delta^4 y_0$ for $e^x - x^2$ in the interval [0,1] with $h=0.2$. **[2]**

OR

Find the root of $x^3 - \log x - 1.05 = 0$.

SECTION B

Attempt any 4 of the following **(5×4=20 Marks)**

9. Find the value of y at $x=4.1$ from following data:

x	0	1	2	3	4	5
y	1	0.1	0.01	0.001	0.0001	0.00001

10. Evaluate $\int_1^{1.5} \frac{x}{x^2-2} dx$ using some suitable method. Find the result to 5 correct places of decimal.

11. Using Runge-Kutta method, solve the differential equation $\frac{dy}{dx} = x + x^2 - y$ for x=0.25 with initial condition x_0=0 and y_0=0.

12. Derive Stirling's interpolation formula. Write down at least 5 terms.

13. Find the approximate polynomial corresponding to given data:

x	1.1	1.2	1.5	1.9	2.4
y	0.4	0.8	1.2	1.2	1.5

SECTION C

Attempt any 2 of the following **(10×2=20 Marks)**

14. Explain Picard's successive approximation method to find the solution of differential equation $\frac{dy}{dx} = f(x, y)$ with given initial values x_0 and y_0. Hence solve the equation $\frac{dy}{dx} - y + x = 2.7$ such that $y(0)$=0.

15. Compare the results of the integral $I = \int_{0.15}^{1.05} \left(\frac{x^3 - x}{3} + x^2 \right) dx$ by applying Simpson's 1/3 rule and 3/8 rule. Which one is accurate as compared to the actual result?

16. Find dy/dx at x=0.2 if $y = x \sin x$. Use Newton's forward formula for the calculation in the interval [0,1] with step size 0.2.

(End of the paper)