Ex./UG/M/CORE-7/29/2019

INTER BACHELOR OF SCIENCE EXAMINATION, 2019

(2nd Year, 1st Semester)

MATHEMATICS (HONOURS)

Numerical Methods

Paper : CORE - 07

Time : 1 hr. 30 mins Full Marks : 30

(Notations and symbols have their usual meanings.)
Use a separate answer script for each part.

PART - I (15 marks)
Answer ***q.no. 1*** and any ***two*** from the rest.

1. Define a well-posed problem. 1

2. If f*l*(x) denotes floating point representation of a real number x, then prove that

$$\frac{|fl(x)-x|}{|x|} \le \mu = \begin{cases} \frac{1}{2}\beta^{1-t} & \text{for rounding off} \\ \beta^{1-t} & \text{for chopping} \end{cases}$$

Verify the above theorem for the decimal number x = 0.3357 taking t = 3. 5+2

(Turn over)

3. Describe Secant method for solving nonlinear equation in one variable. Give the geometrical interpretation of the method. Use the above method to find a root of the equation $x^2 - 2 = 0$ in [0,2] correct upto four decimal places. 1+1+5

4. Use Gauss Jordan method to solve the following linear system of equations :

$$x + y + z = 1$$
$$4x + 3y - z = 6$$
$$3x + 5y + 3z = 4$$

Find the solution correct upto two decimal places. 7

PART - II (15 marks)

5. Establish Newton's backward interpolation formula for a set of values (x_i, y_i) with $y_i = f(x_i)$ $\forall i = 0,1,2,...n$. Estimate the error in the formula. 5+2

OR

Derive Euler's method of solving first order differential equation with given initial condition. What is the local truncation error per step ? How do we modify the method to get better accuracy ? 3+1+3

6. Obtain Newton-Cotes integration formula to evaluate $\int_a^b f(x)dx$. Hence, derive Simpson's 1/3rd Rule from it. Mention the error term. 5+2+1

(a) Evaluate $\int_0^6 \frac{dx}{(1+x)^2}$ correct up to four decimal places taking 12 intervals by Weddle's Rule.

(b) Evaluate $\int_0^2 \frac{dx}{3+4x}$ using Gauss-Legendre three point formula. 4+4

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