U.G. 3rd Semester Examination - 2021

MATHEMATICS

[HONOURS]

Course Code : MATH-H-CC-T-07

Full Marks : 40 Time : $2\frac{1}{2}$ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Symbols have their usual meanings.

1. Answer any **five** questions: 2×5=10

   a) Find the number of significant figures in X_A=1.8924 given its relative error as 0.1×10^{-2}.

   b) Show that any divided difference of a constant is zero.

   c) State Stirling's and Bessel's interpolation formula (without error).

   d) Explain the principle of numerical differentiation.

   e) Why the Newton-Raphson method is called the method of tangent?

   f) Evaluate $\Delta(\tan^{-1}x)$.

   g) What do you mean by the order of convergence for solving algebraic equation?

   h) Write down the error formula for composite Simpson's 1/3rd rule.

2. Answer any **two** questions: 5×2=10

   a) Establish Newton's backward interpolation formula. When is this formula used?

   b) Establish a general quadrature formula for equidistant ordinates and deduce Trapezoidal rule for numerical integration.

   c) State the Newton-Raphson formula for solving a transcendental equation and explain the limitation of using Newton-Raphson formula.

   d) Show that the total number of multiplications and divisions required to solve a system of n linear equations in n unknowns by Gauss elimination method is $\frac{1}{3}n^3+n^2-\frac{1}{3}n$.

3. Answer any **two** questions: 10×2=20

   a) i) Establish Lagrange's Interpolation formula.

ii) Find the Lagrange's interpolation polynomial to fit the following data:

i	0	1	2	3
x_i	0	1	2	3
$y = f(x_i)$	0	1.72	6.39	19.08

5+5

b) Deduce the method of iteration for numerical solution of an equation of the form $x = \emptyset(x)$ and obtain the condition of convergence. 6+4

c) Describe Gauss elimination method for numerical solution of a system of linear algebraic equations. Examine the necessity of the pivoting process involved in it. 7+3

d) By integrating Newton's forward interpolation formula, obtain the basic form of Simpson's 1/3rd rule for numerical integration. Obtain also the composite form of this rule. Further find the truncation error in Trapezoidal rule.

4+2+4

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