B.Sc. Semester-VI Examination, 2022-23

MATHEMATICS [Programme]

Course ID : 62110 Course Code : SP/MTH/604/SEC-4

Course Title : Numerical Analysis with Practical (Theory)

Time : 1 Hour 15 Minutes Full Marks : 25

The figures in the right-hand margin indicate marks.

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

Notations and symbols have their usual meaning.

1. Answer any **five** of the following questions: 1×5=5

a) If x = 3.21 and y = 5.32 have absolute errors $\Delta x = 0.004$ and $\Delta y = 0.007$, find the relative error in $x+y$.

b) Define complete pivoting and partial pivoting of Gaussian elimination method.

c) Define transcendental equation with example.

d) Write down the geometrical interpretation of trapezoidal rule.

e) When Newton-Raphson method fails? Justify your answer.

f) Write down the appropriate value of $\frac{6}{7}$ correct up to four significant figures and then find the percentage error in such approximation.

g) Write down the condition of convergence and rate of convergence of Fixed Point Iteration method.

h) Given $\frac{dy}{dx} = x^3 + y$, $y(0)$ = 1, compute $y(0.02)$ by Euler's method correct up to four decimal places, taking step length h = 0.01.

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

a) i) Describe Newton-Cotes numerical integration formula and deduce Simpson's 1/3 rule from it.

ii) If T_1 and T_2 denote the Trapezoidal approximation to $I = \int_a^b f(x)\,dx$ with one and two sub-interval respectively, show that $1 - T_2 = \frac{(T_2 - T_1)}{3}$. 3+2

b) i) If N is a function of different measurable quantities u, v, w, x, y and is given by $N = \frac{u^p v^q w^n}{x^s y^t}$. Find an upper limit to the relative error to the measure of N.

ii) Find a real root of the equation $x^3+2x-1=0$ by iteration method correct up to two places of decimal. 2+3

c) Compute $f'(1.16)$ and $f''(1.16)$ from the following table:

x	1.11	1.12	1.13	1.14	1.15	1.16
$f(x)$	6.2321	6.2544	6.2769	6.2996	6.3225	6.3456

3. Answer any **one** of the following questions: 10×1=10

a) i) Find f(1.5) using Newton's Forward formula from the following table:

x :	1	2	3	4	5	6	7	8
f(x) :	1	8	27	64	125	216	343	512

ii) Prove that $E.\Delta = \Delta.E$, all symbols have their usual meaning.

iii) Calculate $\int_0^1 \frac{x}{1+x} dx$ correct up to three significant figures, taking six intervals by Simpson's one-third rule. 5+2+3

b) i) Solve the following system of equations by Gauss Elimination method:

$$2x_1 + 3x_2 + x_3 = 9$$

$$x_1 + 2x_2 + 3x_3 = 6$$

$$3x_1 + x_2 + 2x_3 = 8$$

ii) Describe convergence of Regula-Falsi method.

iii) Given the following table, find $f(x)$ assuming it to be a polynomial of three degree in x. 5+2+3

x :	0	1	2	3
f(x) :	1	2	11	34

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