

This question paper contains 3 printed pages]

NEPNY—52—2023

FACULTY OF SCIENCE

M.Sc. (NEP) (First Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

PHYSICS

SPHYC-403

(Numerical Techniques and C-Programming)

(Tuesday, 26-12-2023)

Time : 10.00 a.m. to 1.00 p.m.

Time—3 Hours

Maximum Marks—80

- N.B. :—**
- (i) All questions carry equal marks.
 - (ii) Q. No. 1 is compulsory.
 - (iii) Solve any *three* of the remaining five questions (Q. No. 2 to Q. No. 6).
 - (iv) Figures to the right indicate full marks.
 - (v) Use of scientific calculator is allowed.

1. Solve the following questions (5 marks each) : 20
- (a) Derive an expression for Newton Forward interpolation formula.
 - (b) Evaluate :
$$\int_0^1 \frac{dx}{1+x^2}$$
 using Simpson's $\frac{1^{rd}}$ rule.
 - (c) Discuss Gauss elimination method for the solution of simultaneous equations.
 - (d) Executable and non-executable statements in C-programming.

P.T.O.

2. (a) Derive Newton's forward difference interpolation formula and for the data construct the forward difference formula, hence, find $f(0.5)$. 10

x	-2	-1	0	1	2	3
$f(x)$	15	5	1	3	11	25

- (b) Find the approximate value of I , $I = \int_0^1 \frac{dx}{1+x}$, using the trapezium rule with 2, 4 and 8 equal subintervals. Using the exact solution, find the absolute error. 10
3. (a) Solve the system of equations 10

$$x_1 + 10x_2 - x_3 = 3$$

$$2x_1 + 3x_2 + 20x_3 = 7$$

$$10x_1 - x_2 + 2x_3 = 4$$

using the Gauss elimination method.

- (b) Discuss Built in and user defined functions in detail. 10
4. (a) Discuss Bisection method and find a real root of equation $x^3 - 2x - 5 = 0$ using Bisection method. 10
- (b) Find inverse of the matrix 10

$$A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix} \text{ using Gauss-Jordan method.}$$

5. (a) Derive Newton-Cotes formula for the numerical integration. 10
- (b) Write a C-programme for the addition of two 3×3 matrix. 10

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(3)

NEPNY—52—2023

6. Solve the following questions (5 marks each): 20

- (a) Linear interpolation
- (b) What are random numbers ? How random numbers are generated in C-programming ?
- (c) Euler method
- (d) Solution of elliptic equation using finite difference method.