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NEPRT—52—2024

FACULTY OF SCIENCE

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

APRIL/MAY, 2024

PHYSICS

(Numerical Techniques and C-Programming)

(Wednesday, 24-04-2024) **Time : 10.00 a.m. to 1.00 p.m.**

Time—Three Hours *Maximum Marks*—80

N.B. :— (*i*) *All* questions carry equal marks.

(*ii*) Question No. **1** is compulsory.

(*iii*) Solve any *three* of the remaining five questions (Q. Nos. **2** to **6**).

(*iv*) Figures to the right indicate full marks.

(*v*) Use of scientific calculator is allowed.

1. Solve the following questions (each question carries **5** marks) : 20

(*a*) Explain the principle of least squares.

(*b*) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\frac{1}{3}$rd rule.

(*c*) Discuss Gauss-Jordan matrix inversion method.

(*d*) Executable and non-executable statements in C-programming.

2. (*a*) Explain the Bisection method to obtain roots of a polynomial equation and find a real root of the equation $f(x) = x^3 - x - 1 = 0$. 10

P.T.O.

(*b*) Find the approximate value of $I = \int_0^1 \frac{dx}{1+x}$, using the Trapezium rule with 2, 4 and 8 equal subintervals using the exact solution. Find the absolute error.

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*) Write a C-programme for the addition of two 3 × 3 matrix. 10

4. (*a*) Derive Newton's Backward difference interpolation formula and for the given data, find $f(22)$: 10

x	$f(x)$
20	354
25	332
30	291
35	260
40	231
45	204

(*b*) Find inverse of the matrix using Gauss-Jordan method : 10

$$A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}.$$

5. (*a*) Derive Newton-Cotes formula for the numerical integration. 10

(*b*) What are random number ? How are random numbers generated in C-programming ? 10

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

(*a*) Discuss Built-in and user defined functions.

(*b*) Euler's method.

(*c*) Solution of elliptical equation using finite difference method.

(*d*) Fitting curve of the form $y = ax^b$.