M.Sc. II Semester Degree (CBCS) Examination, September/October - 2022
PHYSICS
21PHY2C5L : Computational Physics

Time : 3 Hours   Maximum Marks : 70

Note : *Answer* **any five** *of the following questions with question no.* **1** *is* **compulsory**. *Each question carries* **equal** *marks.*

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1. (a) Explain basic data types available in C with the help of example.   **7**

   (b) Write a C program to calculate Fibonacci series using while loop.   **7**

2. (a) Using Trapezoidal rule, evaluate $\int_{0}^{1}\dfrac{dx}{1+x^2}$ for 10 intervals.   **7**

   (b) Solve the following system of equations by Gauss Elimination method.   **7**
$$x+2y-5z=-9$$
$$3x-y+2z=5$$
$$2x+3y-z=3$$

3. (a) Write down Laplace equation for 3 dimensions in Cylindrical and Spherical polar coordinates.   **4**

   (b) By separating the variables, find the solution of the one-dimensional wave equation $\dfrac{\partial^2 u}{\partial t^2} = C^2 \dfrac{\partial^2 u}{\partial x^2}$.   **10**

4. (a) Find the moment generating function of a Poisson distribution. Hence find mean and variance.   **7**

   (b) In a continuous distribution, the frequency density function is given by   **7**
$$f(x) = y_0 \cdot x (2 - x); 0 \leqslant x \leqslant 2$$
Find y_0, mean, variance, coefficients of skewness and kurtosis. Hence comment on the nature of the distribution.

5. (a) Define Error. Explain different sources of error.   **4**

(b) The refractive index (μ) of water is found to have the values 1.29, 1.33, 1.34,   **10** 1.35, 1.32, 1.36, 1.30 and 1.33. Calculate the mean value, absolute error, the relative error and the percentage error.

6. (a) Find y(1.0) accurate up to four decimal places using Modified Euler's method   **7** by solving the IVP $y' = -2xy^2$, $y(0) = 1$ with step length 0.2.

(b) State one dimensional heat flow equation and find its solution.   **7**

7. (a) What is Chi Square Text ? Explain Chi Square statistic and Chi Square   **6** P-values.

(b) Define Lagrange's Interpolation formula. Using Lagrange's interpolation   **8** formula find y(10) from the following table.

x	5	6	9	11
y	12	13	14	16

8. (a) Explain the basic concepts of partial differential equation.   **5**

(b) Find the solution of $f(x) = x^2 - 10 = 0$ using the following methods and starting   **5** points: Newton - Raphson method, with $x_0 = 0$ and $\varepsilon = 0.01$

(c) Discuss briefly propagation of errors.   **4**

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