Class Test-2

Paper: Mathematical Physics-II   **Date-03/04/2024**

Class: B.Sc (H) Physics

Date- 03/04/2023

Semester: IInd

Department: Physics

Duration: 1 hours

M.M.: 20

Instructions:

1. Answers should be handwritten and share the scanned copy in the form of one PDF file.
2. **Please mention Name, Roll No, Name of Course, Semester & Title of paper on the top of Script .**

3. **Solved Script should be uploaded on Google classroom before time.**

4. Attempt any questions which complete 20 marks.

Question 1: Define orthogonal curvilinear coordinates. Explain how to obtain the scale factors for a coordinate system.

[2 Marks]

Question 2: (a) Explain the expression for the Laplacian operator in orthogonal curvilinear coordinates.

[2 Marks]

(b) Derive the expression for the gradient of a scalar field in cylindrical coordinates (r, θ, z).

[3 Marks]

Question 3: (a) Discuss the importance of orthogonal curvilinear coordinates in solving physical problems.

[2 Marks]

(b) Obtain the expression for the Laplacian in spherical coordinates (r,θ,ϕ).

[3 Marks]

Question 4: State the Dirichlet conditions for a function $f(x)$ to be represented by a Fourier series.

[2 Marks]

Question 5: (a) Find the Fourier series representation of the function $f(x)=x$ over the interval $[-\pi,\pi]$.

[3 Marks]

(b) Determine whether the function $f(x)=|x|$ satisfies the Dirichlet conditions for a Fourier series representation over the interval $[-1,1]$.

[2 Marks]

Question 6: (a) Explain Parseval's theorem in the context of Fourier series.

[2 Marks]

(b) Find the Fourier series representation of the function $f(x)=x^2$ over the interval $[-L,L]$.

[3 Marks]