PG/IIS/PHS/202/25

M.Sc. 2nd Semester Examination, 2025

PHYSICS

(*Methods of Mathematical Physics-II*)

PAPER – PHS-202

Full Marks : 25

Time : 1 hour

Answer **all** questions

The figures in the right hand margin indicate marks

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

GROUP–A

Answer any **two** questions : 2×2

1. Find the Laplace transform of $f(t) = \frac{\sin t}{t}$.

2. Find finite Fourier sine transform of t^2 in the range $0 \leq t < \pi$.

3. Find the Green's function in term of eigen values and eigen function of

$$\frac{d^2\psi}{dx^2} + \psi = f(x)$$

with the boundary conditions $\psi(0) = 0 = \psi(1)$.

4. Show that the factor group of a cyclic group is cyclic.

GROUP–B

Answer any two questions : 4×2

5. Find the classes of D_3 group.

6. Solve the integral equation

$$f(t) = 1 + 2\int_0^t f(t-x)e^{-2x}\,dx.$$

7. Show that

$$\hat{L}\left\{\int_0^{\infty} \frac{\sin(xt)}{\sqrt{x}}\,dx\right\} = \frac{\pi}{(2s)^{1/2}}$$

where $\hat{L}$ = Laplace transform.

8. Show that $x' = ax + b$ form a group and find the generator. (a, b are real constants)

GROUP—C

Answer any one question : 8×1

9. (*i*) Solve :

$$\left(D^2 - DD' - 2D'^2\right)z = (y-1)e^x$$

using Lagrange's method, where

$$D = \frac{\partial}{\partial x};\ D' = \frac{\partial}{\partial y}.$$

(*ii*) Solve:

$$\frac{d^2y}{dx^2} + y = \theta(t-\pi) - \theta(t-2\pi)$$

with $y(0) = y'(0) = 0$.

where θ represents unit step function. 4 + 4

10. Find the invariant subgroup and factor group of D_4. 4 + 4

[Internal Assessment — 5 Marks]