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Reg. No. ☐☐☐☐☐☐☐

II Semester M.Sc. Degree Examination, October – 2023
PHYSICS
Mathematical methods of Physics-II
Paper : PHY 201
(CBCS Scheme 2019-20 Freshers)

Time : 3 Hours   **Maximum Marks : 70**

Instructions to Candidates:

Answer all parts. All parts are compulsory.

PART-A

1. a) With necessary criteria, explain elliptical, parabolic and hyperbolic equations. **(5)**

    b) The displacement (y) of a viscously damped string is given by the equation

    $$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2} - 2k \frac{\partial y}{\partial t}$$

    Find a general solution of the equation by the method of separation of variables.

    (10)

(OR)

2. a) Mention the properties of Green's function. **(5)**

    b) Obtain the solution of the following differential equation using Green's function. **(10)**

    $$x^2 \frac{d^2\psi}{dx^2} + x \frac{d\psi}{dx} + \left(k^2 x^2 - n^2\right)\psi x = f(x), 0 \le x \le a$$

    Having a boundary condition that $\psi(0)$ if finite and $\psi(a) = 0$.

3. a) How a symmetry group of a square is represented in group theory? Explain. **(5)**

    b) How are continuous groups represented? Discuss SO(2), SO(3) and SU(2) groups and their representations. **(10)**

(OR)

[P.T.O.

4. a) Show that the identity of a subgroup is same as that of the group. **(5)**

    b) Define homomorphism and isomorphism of groups in group theory. **(5)**

    c) Prove that permutations of three members form the group (S_3) isomorphic to D3 group. **(5)**

5. a) Write a note on control statements in c-program. **(5)**

    b) Describe Simpson $\frac{1}{3}rd$ rule for solving numerical integration. Using this rule, evaluate
    $$\int_0^1 \frac{dx}{1+x}.$$
    (10)

(OR)

6. a) Using Gauss elimination method, solve the following set of equation
    $$x_1 + x_2 + x_3 = 3;\ 2x_1 + 3x_2 + x_3 = 6\ and\ x_1 - x_2 - x_3 = 3.$$
    (5)

    b) By making use of an equation, $y = mx + c$, obtain expressions for the slope and intercept by least square fit method. Where m and c, represent slope and intercept, respectively. **(5)**

    c) Discuss on different arithmetic operators in c-language. **(5)**

PART - B

Answer any Five of the following.   **(5×5=25)**

7. a) Explain the classification of partial differential equations.

    b) Define spherical harmonics and list its properties.

    c) Show that a finite group may be written as a sum of a particular subgroup and its finite number of cosets.

    d) Show that the number of independent parameters of the SU(2) group is three.

    e) How differential equations are solved using Euler method? Explain.

    f) What do you mean numerical integration? Explain.