K26P 1222

Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree (C.B.C.S.S. – O.B.E. – Reg./Supple./Imp.) Examination, April 2026
(2023 Admission Onwards)
PHYSICS/PHYSICS WITH COMPUTATIONAL AND NANO SCIENCE SPECIALIZATION PROGRAMME
MSPHY02C10/MSPHN02C10 : Mathematical Physics – II

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **any 5. Each one** carries **3** marks.

1. Check whether the function f(z) = xy is harmonic or not. If yes, find the conjugate.
2. State and prove Cauchy's integral theorem.
3. Explain with example a) coset b) cyclic groups c) invariant sub groups.
4. Deduce trapezoidal rule.
5. Discuss least square fitting.
6. Derive mean and variance of binomial distribution. **(5×3=15)**

SECTION – B

Answer **any 3. Each one** carries **6** marks.

7. Find the residue of $f(z) = \frac{ze^{iz}}{z^4 + a^4}$ at its poles.
8. Obtain the Laplace transform of the derivatives.
9. Discuss SU(n) groups.

P.T.O.

10. Use Runge-Kutta method of fourth order to solve the equation $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, given y(0) = 1 at x = 0.4. (2 steps)
11. Let X have the density function $f(x) = 0.75(1 - x^2)$ if $-1 \le x \le 1$ and zero otherwise. Find the distribution function. Find the probabilities $P(-1/2 \le X \le 1/2)$ and $P(1/4 \le X \le 2)$. Find x such that $P(X \le x) = 0.95$. **(3×6=18)**

SECTION – C

Answer **any 3. Each one** carries **9** marks.

12. Deduce the necessary and sufficient condition for a complex function to be analytic.
13. Define group. What is the condition for a group to be Abelian. Given two elements A and B subject to the relations $A^2 = B^2 = E$ (the identity), show that :
    a) $AB \neq BA$, and
    b) the set of six elements E, A, B, A^2, AB, BA form a group.
14. a) Find the transforms of sinh at and cosh at.
    b) Find the inverse Laplace transform of $f(s) = \frac{a}{s^2 - a^2}$.
15. Discuss Euler method for solving first order ordinary differential equation.
16. Discuss normal distribution. In a production of iron rods let the diameter X be normally distributed with mean 2 in. and standard deviation 0.008 in.
    a) What percentage of defectives can we expect if we set the tolerance limits at 2 ± 0.02 in. ?
    b) How should we set the tolerance limits to allow for 4% defectives ? **(3×9=27)**
