QP CODE: 25805163

25805163

Reg No : .....

Name : .....

INTEGRATED M.Sc DEGREE EXAMINATION, NOVEMBER 2025

Seventh Semester

INTEGRATED M.Sc BASIC SCIENCE-PHYSICS

CORE - IPH7CR04 - MATHEMATICAL PHYSICS - II

2021 Admission Onwards

D771108D

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Discuss any two properties of Fourier series.
2. Obtain the Fourier series expansion for the output of a full wave rectifier.
3. What do you mean by Laplace transform?
4. What do you mean by inverse Laplace transform?
5. Get Cauchy-Riemann conditions for analytic functions.
6. Get Taylor's expansion of $(1-z)^{-1}$ about the point $z=0$.
7. What do you mean by the isolated singularity of an analytic function?
8. What do you mean by elliptic, parabolic, and hyperbolic partial differential equations?
9. Write down the form of the Helmholtz equation in spherical polar coordinates. Also, write down its general solution.
10. What do you mean by cylindrical harmonics?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Obtain convolution theorem of Parseval's relation.
12. How do you convert a wavefunction from position space to momentum space? Explain with an example.
13. Obtain the Laplace transform of damped oscillator.
14. Get the definition of integral of a complex function along any curve c from the point z_1 to z_2. Also get the properties of complex integrals.

15. Evaluate $\oint \frac{e^{2z}}{(z+1)^4} dz$.

16. Show that $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta} = \frac{2\pi}{\sqrt{3}}$.

17. Discuss the solution of Laplace's equation in cartesian coordinates by the method of separation of variables.

18. Write down the Laplace's equation in spherical polar coordinates and arrive at spherical Harmonics.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. (a) Discuss infinite and finite Fourier sine and cosine transforms. (b) Find finite Fourier sine and cosine transforms of the function $f(x)=x^2$; $0<x<4$.

20. State and prove Cauchy's integral theorem. Also prove that if $f(z)$ is an analytic function of z, the line integral will be independent of the path. Extend the Cauchy theorem to a doubly connected region and a Multiply connected region.

21. State and prove Laurent's theorem.

22. Discuss the heat equation in cartesian coordinates and hence get the solution of the heat flow equation by the method of separation of variables.

(2×5=10 weightage)