Reg. No .... Name **25P2004**

M. Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2025

SEMESTER 2 : PHYSICS

COURSE : **24P2PHYT05 : MATHEMATICAL METHODS IN PHYSICS - II**

(For Regular 2024 Admission)

Duration : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	Write a note on Gamma functions.	(U)
2.	State the necessary and sufficient conditions for a function to be analytic.	(U)
3.	Evaluate $\mathcal{L}(t^n e^{at})$.	(A)
4.	Separate the partial differential equation $\nabla^2\psi(x,y,z)=0$, into three ordinary differential equations.	(A)
5.	Show that $f(z)=z^2$ satisfies Cauchy Reimann equations.	(A)
6.	State and explain the theorem of Fourier series.	(U)
7.	Write the Legendre's equation for n order.	(U)
8.	What is the Laplace transform of cosh(at)?	(A)
9.	Express Taylor series expansion for a function f(z) with centre at z_0.	(U)
10.	Write down two fundamental equations of Physics that are in the form of partial differential equation.	(A)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	Find the Laplace transform of $f(t)$ defined as $f(t)=\begin{cases} t,\ 0<t<1 \\ 1,\ t>1 \end{cases}$	(A)
12.	Prove that $P_m(0)$ = $(-1)^m \frac{2m!}{2^{2m}(m!)^2}$.	(A)
13.	Find the Green's function for the differential equation $\frac{d^2y}{dx^2}+k^2y=f(x)$, subject to the boundary conditions $y(0)=0=y(a)$.	(A)
14.	Obtain the one dimensional heat equation.	(A)
15.	Show the transformation of gamma function.	(A)
16.	Given w(x,y) = u(x,y)+iv(x,y). If u and v are real functions and if w is analytic, show that $\nabla^2u=\nabla^2v=0$.	(A)
17.	Explain the momentum representation of a quantum particle.	(An)
18.	Expand cos(z) as a Taylor series about $z=\pi/4$.	(A)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19.	Show that $\int_0^\infty \frac{x^a}{x+1}dx=\frac{\pi a}{\sin \pi a}$ where $-1<a<1$.	()
20.	Find the Laplace transform of (i) $\frac{\sin(at)}{t}$ and (ii) $\frac{\cos(at)-cos(bt)}{t}+tsin(at)$	(A)

21. Obtain the recurrence relations for Laguerre polynomial. (A)

22. Obtain one dimensional heat flow equation. Find its solution by method of separation of variables. (A)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;