

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086
(For candidates admitted from the academic year 2023 – 2024)

M. Sc. DEGREE EXAMINATION, APRIL 2024
BRANCH III - PHYSICS
SECOND SEMESTER

COURSE : MAJOR CORE
PAPER : MATHEMATICAL PHYSICS - II
SUBJECT CODE : 23PH/PC/MP24
TIME : 3 HOURS **MAX. MARKS: 100**

Q. No.	SECTION A (Answer ALL Questions) 10 x 3 = 30 Marks	CO	KL
1.	Find $L[\cos \omega t]$.	CO1	K1
2.	Find the Fourier sine transform of $1/x$	CO1	K1
3.	Express Laplace's equation in two dimensional cylindrical coordinates (r, θ) .	CO1	K1
4.	What is the one dimensional wave equation?	CO2	K2
5.	What is orthogonality of Bessel's function?	CO2	K2
6.	Define Hankel functions of first kind.	CO2	K2
7.	Distinguish isomorphism and homomorphism of the group.	CO2	K2
8.	What do you mean by cosets?	CO3	K3
9.	Define Standard deviation and write its formula.	CO3	K3
10.	State binomial theorem of probability	CO3	K3
Q. No.	SECTION B 6x5=30 Marks	CO	KL
PART – A Answer Any TWO Questions (2x5=10)			
11.	Evaluate $L^{-1} \left\{ \frac{3s-2}{s^3(s^2+4)} \right\}$	CO3	K3
12.	Show that $H_n(-x) = (-1)^n H_n(x)$	CO3	K3
13.	The mean and variance of binomial distribution are 8 and 6. Find $P(x \geq 2)$.	CO3	K3
PART – B Answer Any FOUR Questions (4x5=20)			
14.	State and prove Convolution theorem.	CO4	K4
15.	Solve the differential equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, if $u(x,0) = \sin \Pi x$.	CO4	K4
16.	Prove $x J_n'(x) = n J_n(x) - x J_{(n+1)}(x)$	CO4	K4
17.	Describe character table and Construct the character table for C_{2v} point group.	CO4	K4
18.	The radius of a wire is measured in cm as 0.17, 0.15, 0.18, 0.19, 0.16, 0.17. Find the mean radius and the standard deviation.	CO4	K4

Q. No.	SECTION C Answer ALL Questions 2×20=40 Marks	CO	KL
19.	(i) a. Find the Laplace transform of sawtooth wave function $f(t) = \frac{at}{T}$ for $0 < t < T$ and $f(t + T) = f(t)$.	CO5	K5
	b. Find the finite sine and cosine transform of $f(x) = \sin ax$	CO5	K6
	(OR)		
	(ii) a. Obtain the solution of wave equation by D'Alembert's method.	CO5	K5
	b. Applying method of variable separation to solve the solution for three dimensional heat flow equation.	CO5	K6
20.	(i) a. Obtain the complete solution for Bessel differential equation.	CO5	K5
	b. Prove the orthogonality of Hermite polynomial.	CO5	K6
	(OR)		
	(ii) a. State and prove Orthogonality theorem of characters in group theory.	CO5	K5
	b. Explicate Poisson's distribution and calculate its mean and moment generating function.	CO5	K6
