QP Code: RM22MSC009 | Reg. No | | | | | | | | | | | AR 22

GIET UNIVERSITY, GUNUPUR – 765022

M. Sc. (First Semester) Examinations, March – 2023

22PHPC101 – Mathematical Methods in Physics

(Physics)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer all questions

		CO#	Blooms Level
a.	Find $\int \frac{sinz}{e^z-1} dz$ where C is $\|z+\pi\| = 2$	CO1	K2
b.	Define singular point?	CO1	K1
c.	State Laurent's theorem.	CO1	K1
d.	Explain quotient law of tensor?	CO2	K1
e.	Show that covariant derivative of δ^i_j is zero?	CO2	K1
f.	Define cyclic group.	CO3	K1
g.	What is Cayley's theorem in Group Theory?	CO3	K1
h.	Prove that: $\boldsymbol{\varepsilon_{ilm}\varepsilon_{jlm} = 2\delta_{ij}}$.	CO3	K2
i.	Show the graph for Bessel polynomial $J_o(x)$ and $J_1(x)$?	CO4	K2
j.	Derive Legendre polynomial $P_o(x)$ and $P_1(x)$?	CO4	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ANY FIVE*** questions

		Marks	CO#	Blooms Level
2.	State and Prove Taylors Theorem? Find the residue of the function f(z)= $\frac{z^2-2z}{(z+1)^2(z^2+4)}$.	10	CO1	K1
3.	Using Cauchy-Residue Theorem show that $\int_0^{2\pi} \frac{cos2\theta}{5+4cos\theta} = \frac{\pi}{6}$	10	CO1	K2
4.	Derive transformation laws for the Christoffel symbols of the first and second kind?	10	CO2	K1
5.	Let G be an abelian group. Prove that the subset $H=\{g \epsilon G: g^2 = e\ (identity\ element)\}$ forms a subgroup of G.	10	CO3	K1
6.	Show that for a finite group G, every representation is equivalent to a unitary representation.	10	CO3	K1
7.a.	Prove that $\int_{-1}^{1} \frac{P_n(x)}{\sqrt{(1-2xt+t^2)}} dx = \frac{2t^n}{2n+1}$ where n is a positive integer.	5	CO4	K2
b.	Express $f(x) = x^3+2x^2-x-3$ in terms of Legendre polynomial?	5	CO4	K2
8.	Derive the generating function of a Bessel polynomial?	10	CO4	K1

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