GIET UNIVERSITY, GUNUPUR – 765022

M. Sc. (First Semester) Regular Examinations, February – 2024

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)**

		CO#	Blooms Level
Q1.	Answer all the questions		
a.	Write Cauchy-Riemann equation in Cartesian and polar form.	CO1	K1
b.	Find the imaginary part of the complex analytic function where real part is $U(x, y) = x^3 - 3xy^3 + 3x^2 - 3y^2 + 1$	CO1	K2
c.	Show that the function $\dfrac{1}{z^3 + 1}$ is analytic or not.	CO1	K1
d.	Show that the covariant derivative of δ^i_j zero.	CO1	K1
e.	State Cauchy Integral Theorem.	CO2	K1
f.	Define Christoffel symbol.		
g.	Define Covariant tensor.	CO3	K1
h.	What is Laplace Transform?	CO4	K1
i.	Write the shifting property of Laplace transform.	CO4	K1
j.	Write the Orthogonality condition of Legendre polynomial.	CO4	K1

PART – B   **(10 x 5 = 50 Marks)**

Answer **_ANY FIVE_** questions

		Marks	CO#	Blooms Level
2.	Find the residue of $f(z) = \dfrac{z}{(2z-4)(3z-5)}$ at $z = \infty$. Explain about different types of singularity?	10	CO1	K1
3.	State and Prove Laurent Theorem? Explain the function, $f(z) = \dfrac{1}{z(z-1)}$ in terms of Laurent's series?	10	CO1	K1
4.	Evaluate $\int_{-\infty}^{\infty} \dfrac{x^2}{(x^2+1)(x^2+4)}$ by contour integration?	10	CO1	K2
5.	Explain the rules governing the tensor analysis and show that if A^i and B_j are the components of a contravariant and covariant tensor of rank one $C^i_j = A^i B_j$ are the components of mixed tensor of rank two?	10	CO2	K1
6.	Show that the number of irreducible representation of an Abelian group equals to the number of group elements?	10	CO3	K1
7.a.	Evaluate $\int_0^\infty \dfrac{x^7}{7^x} dx$	5	CO4	K2
b.	Show that $P'_n(-x) = (-1)^{n+1} P'_n(x)$	5	CO4	K2
8.	Evaluate the Legendre polynomials $P_0(x)$, $P_1(x)$, $P_2(x)$ and $P_3(x)$. Show all the Legendre polynomials in a single graph.	10	CO4	K2

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