QP Code: Reg. No | | | | | | | | | | | AY 24

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

M.Sc. (First Semester - Regular) Examinations, February – 2025

24MPHPC11001– MATHEMATICAL METHODS IN PHYSICS (PHYSICS)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Define removable isolated singularity.	CO1	K1
b. Find the value of 'a' for which f (x ,y) = $9x + 6(x^2-y^2)+5i\ (3xy + ay)$ is analytic?	CO1	K2
c. Write on symmetric tensor.	CO2	K1
d. Show the graph for Bessel polynomial $J_o(x)$ and $J_1(x)$?	CO4	K2
e. Write any three properties of gamma functions.	CO6	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Define Harmonic function. State and Prove Laurent series.	10	CO1	K1
(OR)			
b. Find the residue of f (z) = $\frac{z}{(2z-4)(3z-5)}$ at z = ∞. Explain about different types of singularity.	10	CO1	K1
3.a. Derive an expression for Direction cosines in Tensor using rectangular coordinate system.	10	CO2	K1
(OR)			
b. Show that if A_i and B_j are the components of a contravariant and covariant tensor of rank one $C_{ij} = A_i B_j$ are the components of mixed tensor of rank two.	7	CO2	K1
c. Define Christoffel symbol.	3	CO2	K1
4.a. Prove that the set $\{2^n : n \in Z\}$ with multiplication operation is an abelian group.	10	CO3	K2
(OR)			
b. Show that the number of irreducible representation of an Abelian group equals to the number of group elements.	7	CO3	K2
c. Prove that if every element of a group 'G' be its own inverse, then 'G' is abelian.	3	CO3	K1
5.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.	10	CO4	K2
(OR)			
b. Evaluate the Legendre polynomials Po(x), $P_1(x)$, $P_2(x)$ and $P_3(x)$. Show all the Legendre polynomials in a single graph.	10	CO4	K1
6.a. Evaluate $\int_0^\infty \frac{x^7}{7^x} dx$	10	CO5	K2
(OR)			
b. Show that $\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$	10	CO5	K2

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