ANNAI VIOLET ARTS AND SCIENCE COLLEGE
DEPARTMENT OF PHYSICS

CONTINUOUS INTERNAL ASSESSMENT –I (ODD SEM.)
Subject: Mathematical Methods in Physics

Class : II B.Sc., Physics **Max.Marks : 50**
Date : 2.09.2022-FN **Sub. Code: SR23A**

PART A (5 × 2 = 10 Marks)
Answer any FIVE questions

1. Define 'curl' a vectors field.
2. Find the divergence of the vector $\vec{F} = x^2y\hat{\imath} = y^2z\hat{\jmath} + z^2x\hat{k}$.
3. What is a scalar field?
4. Show that β(m,n) = β(n,m)
5. Define a gamma function.
6. Show that $\beta(4,1) = \frac{1}{4}$.
7. Write the Hermitian and unitary matrix.

PART B – (2 × 5 = 10 Marks)
Answer any TWO questions

8. Find $div\ \vec{F}$ and $Curl\ \vec{F}$ for the vector $\vec{F} = xy^3\vec{\imath} - 2x^2yz\vec{\jmath} + 2yz^4\vec{k}\ at\ (1,-1,1)$
9. Show that $\beta(m,n) = \frac{\Gamma m\,\Gamma n}{\Gamma(m+n)}\ where\ m > 0, n > 0$
10. If $A = \begin{bmatrix} 2+i & 3 & -1+3i \\ -5 & i & 4-2i \end{bmatrix}$ show that AA* is a Hermitian matrix where A* is the conjugate transpose of A.

PART C – (3 × 10 = 30 Marks)
Answer ALL questions

11. Prove that $curl\ curl\ \vec{F} = grad\ \ div\ \vec{F} - \nabla^2\vec{F}$
12. Show that
    (a). $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$ **(5)**
    (b). $\beta(m,n) = \int_0^\infty \frac{y^{m-1}}{(1+y)^{m+n}}$ **(5)**
13. Evaluate $\int_{-\infty}^{\infty} e^{-x^2}\ dx$ using gamma function.

Prepared by
Dr. R. Mahesh
Asst.Prof. –Physics.