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K1849

FIRST SEMESTER M.Sc. DEGREE EXAMINATION
DECEMBER / JANUARY - 06
Branch: – PHYSICS
PH 211 – MATHEMATICAL METHODS IN PHYSICS

Time: 3 Hours   Max. Marks: 75

PART-A

Answer any five questions. Each question carries 3 marks.

1. Derive the polar form of Cauchy-Riemann equations.

2. Find the inverse of the matrix $\begin{bmatrix} 1 & -2 \\ 1 & 1 \end{bmatrix}$.

3. Find $\nabla\phi$ for the function $\phi = 2xz^4 - x^2y$ at the point $(2,-2,-1)$.

4. If H=curl A, prove that $\int_s H.nds = 0$ for any closed surface S.

5. What are symmetric and anti-symmetric tensors.

6. State the elementary properties of a group.

7. Find $L^{-1}\left\{\dfrac{1}{S(S-a)}\right\}$

8. Distinguish between binomial and normal distributions.

(5 x 3=15 marks)

PART-B

Answer all questions. Each question carries 15 marks.

9. a. i. State and prove Cauchy's integral formula.

     ii. Find the residue of $\dfrac{Z^4}{(Z-1)^2 (Z-2)(Z-3)}$ at z=1

(OR)

b. i. From the set of vectors (1 0 1), (0 0 1) and (1 1 0). Construct a set of orthogonal vectors.

ii. Find the characteristic equation of the following matrix.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & 1 \end{bmatrix}$$

10. a. i. Show that $J_{-n}(x) = (-1)^n J_n(x)$

ii. Show that $2J_n^1(x) = J_{n-1}(x) - J_{n+1}(x)$

(OR)

b. Derive the Bessel's differentiating equation and hence obtain Bessel's function of Zeroth order.

11. a. i. Find the Fourier inverse sine transform of $e^{-\lambda n}$.

ii. Find the Laplace Transform of *Sinhat* and *Coshat*.

(OR)

b. i. Show that for a finite group G, every representation is equivalent to a unitary representation.

ii. Show that order of any element of a group is always equal to the order of its inverse.

(3 x 15=45 marks)

PART - C

Answer any three questions. Each question carries 5 marks.

12. a. Show that every orthonormal set of vectors is linearly independent.

b. Find $L^{-1}\left\{ \dfrac{Le^{-2\pi s/3}}{S2+9} \right\}$

c. Show that δ_{ij} is not a tensor.

d. Explain Lie groups.

e. What are the characteristics of poisson's distribution?

f. If $u = x^2 yz$, $v = xy - 3z^2$. Find $\nabla \cdot [(\nabla u) \cdot (\nabla u)]$

(3 x 5 = 15 marks)