PHYSICS

1. Consider the 2×2 matrix $A = \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix}$. The matrix A is (A) Hermitian (B) orthogonal (C) symmetric (D) None of (A), (B) and (C) 2. The integral $\int_{-\infty}^{\infty} (a+bx+cx^2)\delta(x)dx$ is equal to (A) 0 (B) a (C) 1 (D) None of (A), (B) and (C) 3. The integral $\int_{0}^{\infty} t^{3/2}e^{-t}dt$ is equal to (A) $\frac{\sqrt{\pi}}{2}$ (B) $\sqrt{\pi}$ (C) 0 (D) None of (A), (B) and (C) 4. Which of the following complex functions is not analytic? (A) $f(x,y) = 2x + 2iy$ (B) $f(x,y) = 1$ (C) $f(x,y), = x^2 - y^2 + 2ixy$ (D) $f(x,y) = x^2/4 - y^2/4 - ixy/2$ 5. Consider the Legendre polynomial, $P_n(x)$ of degree n . It satisfies the relation $\int_{-1}^{1} [P_n(x)]^2 dx = 2/7$. The value n is (A) 1 (B) 2 (C) 3 (D) 7 6. The square of the distance between the two points $A(r, \theta, \phi)$ and $B(r+dr, \theta+d\theta, \phi)$ in spherical polar coordinates is given by (A) $ds_{AB}^2 = dr^2 + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2$ (B) $ds_{AB}^2 = dr^2 + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2$ 7. Consider the Lagrangian : $L = \alpha q\dot{q}$. The momentum conjugate to q is equal to (A) $m\dot{q}$ (B) $\alpha\dot{q}$ (C) αq (D) None of (A), (B) and (C)			
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