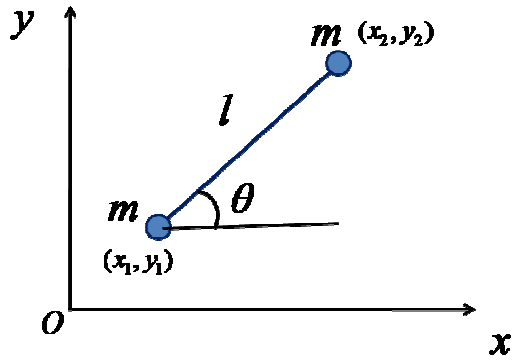
Institute of Engineering and Management

PHYSICS (PH301)

Department of Information Technology

Practice Test During Puja Vacation

1. Evaluate $\iiint \vec{\nabla}.\vec{A}\, dv$, where *v* is the volume of the cubical box bounded by the planes x=0, x=1; y=0, y=1; z=0, z=1. Here, $\vec{A} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$.
2. Two equal masses m are connected through a masless rigid rod of length *l* forming a dumb-bell and this one can rotate in x-y plane. Obtain the Lagrangian equations of motion.



3. Normalize the wave function $\psi(x) = Ae^{ikx}$ over the region $-a \le x \le a$.
4. Given $\psi(x) = \sqrt{a}\ .e^{-ax}$ find the probability of finding the particle between $x = \frac{1}{a}$ and $x = \frac{2}{a}$.
5. An electron is constrained to move in a one dimensional box of length 0.1 nm. Find the first three energy eigen values and de-Broglie wavelength.
6. How does the Poyenting's theorem describe the conservation of energy in electromagnetic field? Show that the average value of Poyenting's vector for a plane electromagnetic wave is $\frac{1}{2}\sqrt{\frac{\mu}{\varepsilon}}\, H_0^2$
7. a) the potential in XY plane is given by

$$V = (x^2 + y^2)^{-\frac{1}{2}}$$

Calculate the electric field at the point (3,4).
b) Why electric field inside a dielectric decreases due to polarization?
8. a) Calculate the magnetic field intensity just outside and inside of a hollow cylinder of radius 4cm carrying 50A current.
b) if a charged particle of charge 0.4 C is moving with a velocity 4i-j-2k m.s-1 through an electric field E= 10i+10k and magnetic field of induction B=2i-6j-6k, then find the Lorentz force experienced by the particle.
9. A solenoid has length 3m and mean radius 0.25 m. Find the magnetic flux density at its centre when a current of 2 A flows through its 3 layers of 1500 turns each.
10. A hollow metal sphere of radius 6 cm is charged such that potential on its surface is 10V. What is the potential and intensity at the centre of the sphere?