Subject: Physics   Code: PY101

Submission date: 15th June, 2022   M. M. 10

Note:- Answer all questions in detail. Each question carries equal marks.

Q1. At what speed does a clock move if it runs at a rate which is one-half the rate of a clock at rest?

Q2. At what speed does a meter stick move if its length is observed to shrink to 0.5 m?

Q3. If the π meson moves with speed 0.95c with respect to the Earth, what is its lifetime as measured by an observer at rest on Earth?

Q4. Two particles come to each other with speed 0.9c with respect to laboratory. What is their relative speed?

Q5. Show that no signal travels faster than light.

Q6. Observer O notes that two events are separated in space and time by 600m and 8×10^{-7} sec. How fast an observer A' be moving relative to O in order that the events be simultaneous to O'?

Q7. What do you understand by a normalized wave function? Normalize the wave function $\psi = e^{icx}$ over the region -a≤ x ≤ a.

Q8. Substitute the wave function $\psi = x \exp(\frac{m\omega x^2}{2\hbar})$ into time independent Schrodinger wave equation. $\frac{\partial^2 y}{\partial x^2} + \frac{2m}{\hbar^2}(E-V)\psi = 0$, where $V = \frac{1}{2}m\omega^2 x^2$. And show that $E = \frac{3}{2}\omega\hbar$.

Q9. What is the minimum uncertainty in the frequency of a photon whose life time is about 10^{-8} sec?

Q10.Write a few applications of Carbon Nanotubes.