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Name.....

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Reg. No.....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2014

(UG-CCSS)

Complementary Course—Physics

PH 2C 03—MECHANICS, RELATIVITY WAVES AND OSCILLATIONS

Time : Three Hours

Maximum : 30 Weightage

I. Answer all *twelve* questions, each question carries $\frac{1}{4}$ weightage :

1 The meson has a speed $0.8c$ relative to ground. If its time of flight in its frame is 2×10^{-8} sec, how far the meson travels relative to ground ?

- (a) $2m$ (b) $4m$.
(c) $6m$ (d) $8m$.

2 At what velocity along its length will a rod contract 50% :

- (a) $c/2$. (b) $\frac{\sqrt{3}c}{2}$.
(c) $\frac{\sqrt{3}c}{4}$. (d) $\frac{\sqrt{3}c}{5}$.

3 Energy mass relation is :

- (a) $E = mc$. (b) $E = p^2 c$.
(c) $E = mc^2$. (d) $E = mc^3$.

4 Two particles are travelling in opposite directions with speed $0.9c$ relative to the laboratory. Their relative speed is

- (a) $0.0948c$. (b) Zero.
(c) c . (d) $0.995c$.

5 The momentum energy relation is :

- (a) $E = p/m$. (b) $E = p^2/m$.
(c) $E = p^2/2m$. (d) $E = p/2m$.

Turn over

- 6 A particle executing SHM has amplitude 0.6 m. The time taken by particle in cover distance 0.3m from mean position, if time period is 3.14 s is :
- (a) 2.6 s. (b) 0.26 s.
(c) 6.2 s. (d) 0.62s.
- 7 The amplitude of a damped oscillator becomes $\frac{1}{2}$ after t second. If the amplitude be $(1/x)$ after $3t$ second, then x is equal to
- (a) 0.8 (b) 8.
(c) 0.4 (d) 4.
- 8 The relation between driving frequency f_d and natural frequency f is :
- (a) $f_d = f$. (b) $f_d = f$.
(c) $f_d = f$. (d) $f_d = f$.
- 9 Friction is _____ force.
- 10 TEM stands for _____.
- 11 The expression for energy density is _____.
- 12 According to Schrodinger a particle is equivalent to a :
- (a) Single wave. (b) Wave packet.
(c) Light wave. (d) Cannot behave as wave.

(12 × ¼ = 3 weight)

II. Answer all *nine* questions. Each question carries 1 weightage.

- 13 What is Coriolis force ?
- 14 Explain the difference between inertial frame and non inertial frame.
- 15 Explain the potential energy curve.
- 16 Explain the significance of mass energy relation.
- 17 Define Simple Harmonic Motion.
- 18 What do you meant by energy density ?
- 19 Explain the expression for time period of a loaded spring.
- 20 Write down an expression for equation of plane progressive wave and explain each term
- 21 Discuss the principle of Electron Microscope.

(9 × 1 = 9 weight)

II. Answer any *five* questions, each question carries 2 weightage :

- 22 Show that mass of the particle moving with $4/5^{\text{th}}$ the speed of light will appear as $5/3$ times its rest mass.
- 23 Distinguish between centrifugal force and Coriolis force with suitable example.
- 24 With suitable example explain motion of a body under central force.
- 25 Obtain the period of oscillation of a simple pendulum.
- 26 State and explain Fourier theorem.
- 27 What are the postulates of quantum mechanics ?
- 28 With suitable example explain Eigen value and Eigen function.

(5 × 2 = 10 weightage)

IV. Answer any *two*, each question carries 4 weightage :

- 29 Derive the Galilean transformation equation and explain its invariance.
- 30 What are the postulates of special theory of relativity and explain the significance of Michelson Morley experiment.
- 31 Derive Time dependent Schrodinger equation of matter waves. Give the physical interpretation of the wave function.

(2 × 4 = 8 weightage)