

Model Question Paper 1

Oscillations 1

11th Standard

Physics

Reg.No. :

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Answer all the Questions

Time : 01:00:00 Hrs

Total Marks : 40

5 x 1 = 5

Part A

- 1) Which of the following is the necessary condition for SHM?
(a) Constant period (b) Constant acceleration (c) displacement and acceleration are proportional (d) displacement and torque are proportional
- 2) The displacement of a particle executing SHM is given by $x = 0.01 \sin(100\pi t + 0.05)$ Its time period is
(a) 0.01 s (b) 0.02 s (c) 0.1 s (d) 0.02 s
- 3) If the displacement of a particle executing SHM is given by $y = 0.05 \sin(100t + \frac{\pi}{2})$ cm The maximum velocity of the particle is
(a) 0.5 cm s^{-1} (b) 0.05 m s^{-1} (c) 100 m s^{-1} (d) 50 m s^{-1}
- 4) If the magnitude of displacement is equal to acceleration, then the time period is
(a) 1 s (b) $\pi \text{ s}$ (c) $2\pi \text{ s}$ (d) $4\pi \text{ s}$
- 5) A body of mass 2 g is executing SHM about a mean position with an amplitude 10 cm. if the maximum velocity is 100 cm s^{-1} its velocity is 50 cm s^{-1} at a distance of (in cm).
(a) $5\sqrt{2}$ (b) $50\sqrt{3}$ (c) $5\sqrt{3}$ (d) $10\sqrt{3}$

Part B

5 x 2 = 10

- 6) Define simple harmonic motion. What are the condition of SHM?
- 7) Show that the projection of uniform circular motion on the diameter of a circle is simple harmonic motion.
- 8) Explain (i) displacement, (ii) Velocity and (iii) acceleration in SHM using component method
- 9) Show graphically the variation of displacement, velocity and acceleration of a particle executing SHM.
- 10) What is the phase difference between (i) velocity and acceleration, (ii) acceleration and displacement of a particle executing SHM?

Part C

5 x 3 = 15

- 11) Obtain an equation for SHM of a particle of amplitude 0.5 m, frequency 50Hz. The initial phase is $\frac{\pi}{2}$. Find the displacement at t=0.
- 12) A particle executing SHM is represented by $y = 2 \sin(2\pi \frac{t}{T} + \phi_0)$. At t=0, the displacement is $\sqrt{3}$ cm. Find the initial phase.
- 13) A body executes SHM with an amplitude 10 cm and periods 2 s. Calculate the velocity and acceleration of the body when the displacement is (i) zero and (ii) 6 cm.
- 14) A disc suspended by a wire, makes angular oscillations. When it is displaced through 30° from the mean position, it produces a restoring torque of 4.6 Nm. If the moment of inertia of the disc is 0.082 kg m^2 , calculate the frequency of angular oscillations.
- 15) A mass of 0.2 kg attached to one end of a spring produces an extension of 15 mm. The mass is pulled 10 mm downwards and set into vertical oscillations of amplitude 10 mm. Calculate (i) the period of oscillation, (ii) maximum kinetic energy.

Part D

2 x 5 = 10

- 16) The equation of SHM is represented by $y = 0.25 \sin(3014t + 0.35)$ where y and t are in mm and s respectively. Deduce (i) amplitude, (ii) frequency, (iii) angular frequency, (iv) period and (v) initial phase.
- 17) A particle executing SHM has angular frequency of $\pi \text{ rad s}^{-1}$ and amplitude of 5 m. Deduced (i) time period, (ii) maximum velocity, (iii) maximum acceleration, (iv) velocity when the displacement is 3m.
