DPP 02

Q.1 A mass M, attached to a horizontal spring, executes SHM with an amplitude A_1. When the mass M passes through its mean position then a smaller mass m is placed over it and both of them move together with amplitude A_2. The ratio of is

(A) $\frac{M}{M+m}$ (B) $\frac{M+m}{M}$ (C) $\left(\frac{M}{M+m}\right)^{1/2}$ (D) $\left(\frac{M+m}{M}\right)^{1/2}$

Q.2 Two simple harmonic motions are represented by the equations $y_1 = 0.1\sin\left(100\pi t + \frac{\pi}{3}\right)$ and $y_2 = 0.1\cos\pi t$. The phase difference of the velocity of particle 1 with respect to the velocity of particle 2 is

(A) $-\pi/3$ (B) $\pi/6$ (C) $-\pi/6$ (D) $\pi/3$.

Q.3 If a simple harmonic motion is represented by $\frac{d^2x}{dt^2} + \alpha x = 0$, its time period is

(A) $2\pi\alpha$ (B) $2\pi\sqrt{\alpha}$ (C) $2\pi/\alpha$ (D) $2\pi/\sqrt{\alpha}$

Q.4 A particle at the end of a spring executes simple harmonic motion with a period t_1, while the corresponding period for another spring is t_2. If the period of oscillation with the two springs in series is T, then

(A) $T = t_1 + t_2$ (B) $T^2 = t_1^2 + t_2^2$ (C) $T^{-1} = t_1^{-1} + t_2^{-1}$ (D) $T^{-2} = t_1^{-2} + t_2^{-2}$

Q.5 Two particles A and B of equal masses are suspended from two massless springs of spring constants k_1 and k_2, respectively. If the maximum velocities, during oscillations, are equal, the ratio of amplitudes of A and B is

(A) $\sqrt{k_1/k_2}$ (B) k_2/k_1 (C) $\sqrt{k_2/k_1}$ (D) k_1/k_2

Q.6 A mass M is suspended from a spring of negligible mass. The spring is pulled a little and then released so that the mass executes SHM of time period T. If the mass is increased by m, the time period becomes 5T/3. Then the ratio of m/M is

(A) 3/5 (B) 25/9 (C) 16/9 (D) 5/3

Q.7 The displacement of a particle varies according to the relation $x = 4(\cos\pi t + \sin\pi t)$. The amplitude of the particle is

(A) -4 (B) 4 (C) $4\sqrt{2}$ (D) 8

Q.8 The total energy of a particle, executing simple harmonic motion is (where x is the displacement from the mean position)

(A) $\propto x$ (B) $\propto x^2$

(C) independent of x (D) $\propto x^{1/2}$

Q.9 The function $\sin^2(\omega t)$ represents

(A) a simple harmonic motion with a period $2\pi/\omega$

(B) a simple harmonic motion with a period π/ω

(C) a periodic, but not simple harmonic motion with a period $2\pi/\omega$

(D) a periodic, but not simple harmonic motion with a period π/ω.

Q.10 In a simple harmonic oscillator, at the mean position

(A) kinetic energy is minimum, potential energy is maximum

(B) both kinetic and potential energies are maximum

(C) kinetic energy is maximum, potential energy is minimum

(D) both kinetic and potential energies are minimum.

ANSWER KEY

1.	(D)	**2.**	(C)	**3.**	(D)	**4.**	(B)	**5.**	(C)	**6.**	(C)	**7.**	(C)
8.	(C)	**9.**	(D)	**10.**	(C)								