QUESTIONS FROM COMPETITIVE EXAMS

5.1 Introduction

(MHT-CET 2003)

1. Dimensions of force constant are

a) $[L^0 M^1 T^{-2}]$ b) $[L^0 M^{-1} T^{-2}]$ c) $[L^1 M^0 T^{-2}]$ d) $[L M T^{-2}]$

5.2 Periodic Motion

(MAH-EN-CET 2004)

2. The frequency of wave is 0.002 Hz. Its time period is

a) 100 s b) 500 s c) 5000 s d) 50 s

(MHT-CET 2011)

3. When a constant force is applied the work done in stretching (if spring constant $k_1 > k_2$) then energy stored in two wire related as

a) $w_1 > w_2$ b) $w_1 = w_2$ c) $w_1 < w_2$ d) $w_2 = 2\ w_1$

(MH-CET 2018)

4. For a particle performing linear S.H.M., its average speed over one oscillation is (a=amplitude of S.H.M. , n = frequency of oscillation)

a) 2 an b) 4 an c) 6 an d) 8 an

(MHT-CET 2020)

5. A body performs S.H.M. due to force 'F_1', with time period 0.8 s. If force is changed to 'F_2', it executes S.H.M. with time period 0.6 s. Now both the forces act simultaneously in the same direction on the same body. New periodic time is

a) 0.12 s b) 0.24 s
c) 0.48 s d) 0.36 s

5.3 Linear Simple Harmonic Motion

(MHT-CET 2004)

6. If the length of a simple pendulum is increased by 44%, then what is the change in time period of pendulum ?

a) 22 % b) 20 % c) 33 % d) 44 %

5.4 Differential Equation of Linear S.H.M. & 5.5 Acceleration, Velocity and Displacement of S.H.M.

(MHT-CET 2002)

7. In S. H. M. path length is 4 cm and maximum acceleration is $2\pi^2$ cm/s^2. Time period of motion is

a) 2 s b) $\sqrt{2}$ s c) 4 s d) 1/2 s

8. Time period of pendulum is 6.28 sec and amplitude of oscillation is 3 cm. Maximum acceleration of pendulum is

a) 8 cm/s^2 b) 0.3 cm/s^2
c) 3 cm/s^2 d) 58.2 cm/s^2

(MHT-CET 2003)

9. If velocity of body is half the maximum velocity, then what is the distance from the mean position?

a) 2 A　　b) $\frac{\sqrt{3}}{2} \times A$　　c) A　　d) $\frac{A}{2}$

10. Particle moves from extreme position to mean position, its

a) kinetic energy increases, potential energy decreases

b) kinetic energy decreases, potential increases

c) both remain constant

d) potential energy becomes zero and kinetic energy remains constant

(MAH-EN-CET 2004)

11. The equation of displacement of particle performing SHM is $x = 0.25 \sin (200 t)$. The maximum velocity is

a) 100 m/s　　b) 200 m/s　　c) 50 m/s　　d) 150 m/s

12. The maximum velocity for particle in SHM is 0.16 m/s and maximum acceleration is $0.64\ m/s^2$. The amplitude is

a) 4×10^{-2} m　　b) 4×10^{-1} m　　c) 4×10 m　　d) 4×10^{0} m

(MHT-CET 2008)

13. A body is performing SHM about its mean position with period 24 s. After 4 s its velocity is π m/s, then its path will be

a) 48 m　　b) 24 m　　c) 52 m　　d) 12 m

(MHT-CET 2009)

14. The periodic time of a particle doing simple harmonic motion is 4 s. The time taken by it to go from its mean position to half the maximum displacement (amplitude) is

a) 2 s　　b) 1 s　　c) $\frac{2}{3}$ s　　d) $\frac{1}{3}$ s

(MHT-CET 2010)

15. The average acceleration of a particle performing SHM over one complete oscillation is

a) $\frac{\omega^2 a}{2}$　　b) $\frac{\omega^2 a}{\sqrt{2}}$　　c) zero　　d) $a\,\omega^2$

(MHT-CET 2011)

16. The maximum velocity of a particle executing S.H.M. is V. If the amplitude is doubled and the time period of oscillation decreases to (1/3) of its original value, then the maximum velocity will be

a) 18 V　　b) 6 V　　c) 12 V　　d) 3 V

(MHT-CET 2012)

17. A particle is performing S.H.M. about its mean position with the equation of velocity given by $4v^2 = 25 - x^2$, then the period of motion is

a) 2π　　b) π　　c) 3π　　d) 4π

(MH-CET 2015)

18. A particle performs S.H.M. with amplitude 25 cm and period 3 s. The minimum time required for it to move between two points 12.5 cm on either side of the mean position is

a) 0.6 s　　b) 0.5 s　　c) 0.4 s　　d) 0.2 s

19. A particle is executing S.H.M. of periodic time 'T'. The time taken by the particle in moving from mean position to half the maximum displacement is
($\sin 30^\circ = 0.5$)

a) $\frac{T}{2}$ b) $\frac{T}{4}$ c) $\frac{T}{8}$ d) $\frac{T}{12}$

(MH-CET 2017)

20. A particle performs linear S.H.M. At a particular instant, velocity of the particle is 'u' and acceleration is 'α' while at another instant velocity is 'v' and acceleration is 'β' ($0 < \alpha < \beta$). The distance between the two positions is

a) $\frac{u^2 - v^2}{\alpha + \beta}$ b) $\frac{u^2 + v^2}{\alpha + \beta}$ c) $\frac{u^2 - v^2}{\alpha - \beta}$ d) $\frac{u^2 + v^2}{\alpha - \beta}$

21. A particle performing S.H.M. starts from equilibrium position and its time period is 16 seconds. After 2 seconds its velocity is π m/s. Amplitude of oscillation is

a) $2\sqrt{2}$ m b) $4\sqrt{2}$ m c) $6\sqrt{2}$ m d) $8\sqrt{2}$ m

(MHT-CET 2019)

22. A particle is performing a linear simple harmonic motion of amplitude 'a'. When it is midway between its mean and extreme position, the magnitudes of its velocity and acceleration are equal. What is the periodic time of the motion ?

a) $2\pi\sqrt{3}$ s b) $\frac{\sqrt{3}}{2\pi}$ s c) $\frac{2\pi}{\sqrt{3}}$ s d) $\frac{1}{2\pi\sqrt{3}}$ s

(MHT-CET 2020)

23. A particle executing S.H.M. has velocities 'v_1' and 'v_2' at distances 'x_1' and 'x_2' respectively from mean position. The angular velocity (ω) of the particle is given by

a) $\sqrt{\frac{x_2^2 - x_1^2}{v_1^2 - v_2^2}}$ b) $\sqrt{\frac{v_2^2 - v_1^2}{x_2^2 - x_1^2}}$ c) $\sqrt{\frac{v_2^2 - v_1^2}{x_1^2 - x_2^2}}$ d) $\sqrt{\frac{v_1^2 - v_1^2}{x_1^2 - x_2^2}}$

(MHT-CET 2021)

24. A particle executes S.H.M. of period $\frac{2\pi}{\sqrt{3}}$ seconds along a straight line 4 cm long. The displacement of the particle at which the velocity is numerically equal to the acceleration is

a) 2 cm b) 1 cm c) 4 cm d) 3 cm

(MHT-CET 2022)

25. The equation of motion of a particle performing linear S.H.M. is $x = 5 \sin\left[4t - \frac{\pi}{6}\right]$, where 'x' is its displacement in cm. The velocity of the particle when its displacement is 3 cm, is

a) 16 cm/s b) 10 cm/s c) 6 cm/s d) 8 cm/s

5.6 Amplitude, Period and Frequency of S.H.M.

(MHT-CET 2006)

26. A load of mass 100 gm increases the length of wire by 10 cm. If the system is kept in oscillation, its time period is ($g = 10\ m/s^2$)

a) 0.314 s b) 3.14 s c) 0.628 s d) 6.28 s

(MHT-CET 2007)

27. The period of oscillation of a mass M, hanging from a spring of force constant k is T. When additional mass m is attached to the spring, the period of oscillation becomes 5T/4. m/M =

a) 9 : 16 b) 25 : 16 c) 25 : 9 d) 19 : 9

(MH-CET 2018)

28. A mass is suspended from a vertical spring which is executing S.H.M. of frequency 5Hz. The spring is unstretched at the highest point of oscillation. Maximum speed of the mass is [acceleration due to gravity $g = 10\ m/s^2$]

a) 2π m/s b) π m/s c) $\frac{1}{2\pi}$ m/s d) $\frac{1}{\pi}$ m/s

(MHT-CET 2020)

29. Two bodies 'A' and 'B' of equal mass are suspended from two separate massless springs of force constants 'k_1' and 'k_2' respectively. The bodies oscillate vertically such that their maximum velocities are equal. The ratio of the amplitude of body A to that of body B is

a) $\sqrt{\frac{k_2}{k_1}}$ b) $\frac{k_2}{k_1}$ c) $\sqrt{\frac{k_1}{k_2}}$ d) $\frac{k_1}{k_2}$

(MHT-CET 2022)

30. A small wooden cube is placed on a plank. The plank performs a vertical S.H.M. of frequency $3/\pi$ Hz. The maximum amplitude of the plank so that the wooden block does not leave the plank is

a) $\frac{7}{12}$ m b) $\frac{5}{2}$ m c) $\frac{5}{18}$ m d) $\frac{11}{18}$ m

5.7 Projection of U.C.M. along a diameter as S.H.M.
5.8 Phase of S.H.M.

(MHT-CET 2004)

31. When a particle performing uniform circular motion of radius 10 cm undergoes the SHM, what will its amplitude be ?

a) 10 cm b) 5 cm c) 2.5 cm d) 20 cm

(MHT-CET 2012)

32. A mass (m) is suspended at the end of a weightless wire of length L, cross-sectional area A and Young's modulus Y. The period of oscillation for the S.H.M. along the vertical direction is,

a) $2\pi\sqrt{\frac{YA}{mL}}$ b) $2\pi\sqrt{\frac{mL}{YA}}$ c) $2\pi\sqrt{\frac{mY}{AL}}$ d) $2\pi\sqrt{\frac{AL}{mY}}$

3. A flat spiral spring of force constant k is loaded with mass M and oscillates about vertically with a time period T. Then the mass suspended to the free end is

a) $\frac{4\pi^2}{kT^2}$ b) $\frac{kT^2}{4\pi^2}$ c) $\frac{kT}{4\pi^2}$ d) $\frac{kT}{4\pi}$

(MHT-CET 2014)

4. A block resting on a horizontal surface executes S.H.M. in horizontal plane with amplitude 'A'. The frequency of oscillation for which the block just starts to slip is (μ = coefficient of friction, g = gravitational acceleration)

a) $\frac{1}{2\pi}\sqrt{\frac{\mu g}{A}}$ b) $\frac{1}{4\pi}\sqrt{\frac{\mu g}{A}}$ c) $2\pi\sqrt{\frac{A}{\mu g}}$ d) $4\pi\sqrt{\frac{A}{\mu g}}$

5.9 Graphical representation of S.H.M.

(MHT-CET 2007)

35. In SHM, graph of which of the following is a straight line ?

a) T.E. against displacement
b) P.E. against displacement
c) acceleration against time
d) velocity against displacement

(MH-CET 2017)

36. A particle is performing S.H.M. starting from extreme position. Graphical representation shows that, between displacement and acceleration, there is a phase difference of

a) 0 rad b) $\frac{\pi}{4}$ rad c) $\frac{\pi}{2}$ rad d) π rad

5.10 Composition of Two S.H.M.'s

(MHT-CET 2005)

37. The displacement of a particle performing simple harmonic motion is given by $x = 8 \sin \omega t + 6 \cos \omega t$, where distance is in cm and time is in second. The amplitude of motion is

a) 10 cm b) 14 cm c) 2 cm d) 3.5 cm

(MHT-CET 2011)

38. If A_1 and A_2 are the amplitudes of two waves superimposing with each other such that $A_1 > A_2$, then difference of maximum amplitude and minimum amplitude is

a) $A_1 + A_2$ b) $A_1 - A_2$ c) $2A_1$ d) $2A_2$

5.11 Kinetic Energy, Potential Energy and Total Energy of a Particle Performing S.H.M.

(MHT-CET 2001)

39. W denotes the total energy of a particle in linear S.H.M. At a point equidistant from the mean position and extremity of the path of the particle

a) K. E. of the particle will be W/2 and P. E. will also be W/2
b) K. E. of the particle will be W/4 and P. E. will be 3 W/4
c) K. E. of the particle will be 3W/4 and P. E. will be W/4
d) K. E. of the particle will be W/8 and P. E. will be 7 W/8