TELANGANA UNIVERSITY
S.S.R. DEGREE COLLEGE, NIZAMABAD (C.C:5029)
I SEMESTER INTERNAL ASSESSMENT II EXAMINATIONS
PHYSICS QUESTION BANK

I. Multiple choice Questions.

1. The differential equation of a simple harmonic oscillator is [c]

(a) $m\frac{d^2x}{dt^2}$ (b) $\frac{d^2x}{dt^2} = -\frac{k}{m}x$ (c) $\frac{d^2x}{dt^2} + \omega^2 x = 0$ (d) $\frac{d^2x}{dt^2} = -Wx$

2. In a solution of simple oscillator, x=a sin(ωt + ϕ) a and ϕ are [d]

(a) a is constant, ϕ is not a constant (b) a is not constant ϕ is constant0

(c) Both are not constants. (d) Both are constants

3. At mean position the velocity of oscillating body is [b]

(a) Minimum (b) Maximum (c) Uniform (d) Can't be determined

4. The maximum displacement from mean position is called __________ [b]

(a) Velocity (b) Amplitude (c) Oscillation (d) None

5. The frequency, ν of oscillations can be determined by [d]

(a) $\nu = \frac{1}{T}$ (b) $\nu = \frac{\omega}{2\pi}$ (c) $\nu = \frac{1}{2\pi}\sqrt{\left(\frac{k}{m}\right)}$ (d) All the above

6. For a cylinder, the moment of inertia, I is equal to [a]

(a) $\frac{1}{2}MR^2$ (b) $\frac{2}{4}MR^2$ (c) $\frac{\pi\eta r^4}{2l}$ (d) -cq

7. Which among the following acts on compound pendulum for which it does not stop in rest position but swings to opposite side. [d]

(a) Oscillations (b) Restoring force (c) Amplitude (d) Inertia

8. In a oblique ellipse, when $\phi = \frac{\pi}{4}$ and $\sin\phi = \frac{1}{\sqrt{2}}$ then $\cos\phi$ = __________ [a]

(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{-1}{\sqrt{2}}$ (c) 1 (d) 0

9. The nature of resultant path traced out by a particle depends on [d]

(a) Amplitude of vibrations (b) Frequency of two vibrations

(c) Phase difference between them (d) All the above.

10. For graphical representation of lissajous figure which of the following is not true [b]

(a) Same frequency and having a phase difference zero

(b) Same frequency but having a phase difference $\frac{\pi}{2}$

(c) Frequencies in the ratio 1: 2 and phase difference zero

(d) Frequencies in the ratio 1: 2 and phase difference $\frac{\pi}{2}$

11. The angular frequency of n^{th} mode of longitudinal oscillations of 'N' couple oscillators is given by [c]

(a) $\omega_n = \frac{\omega_0}{2}\sin\left(\frac{n\pi}{2(N+1)}\right)$ (b) $\omega_n = \frac{\omega_0}{2}\cos\left(\frac{n\pi}{2(N+1)}\right)$

(c) $\omega_n = 2\omega_0\sin\left(\frac{n\pi}{2(N+1)}\right)$ (d) $\omega_n = 2\omega_0\cos\left(\frac{n\pi}{2(N+1)}\right)$

12. The amplitude of the normal mode of longitudinal oscillations of 'N' couple oscillators is given by [c]

(a) $AP = C\sin\left(\frac{p\pi}{n(N+1)}\right)$ (b) $AP = C\cos\left(\frac{p\pi}{n(N+1)}\right)$

(c) $AP = C\sin\left(\frac{pn\pi}{N+1}\right)$ (d) $AP = C\cos\left(\frac{pn\pi}{N+1}\right)$

13. The damping condition for over damped motion in a damped harmonic oscillators is given by [b]
(a). $b^2 = \omega^2$ (b) $b^2 > \omega^2$ (c) $b^2 < \omega^2$ (d) None of the above
14. The damping condition for critical damping motion in a damped harmonic oscillator is given by [c]
(a) $b^2 < \omega^2$ (b) $b^2 > \omega^2$ (c) $b^2 = \omega^2$ (d) None of the above
15. The damping condition for under damped motion in a damped harmonic oscillator is given by [a]
(a) $b^2 < \omega^2$ (b) $b^2 = \omega$ (c) $^2b^2 > \omega^2$ (d) None of the above
16. The power dissipation in damped harmonic oscillator is represented as [b]
(a) $P = \sqrt{2bE}$ (b) P = 2bE (c) $P = \frac{1}{2}bE$ (d) $P = \frac{1}{2}\sqrt{bE}$
17. The displacement of a damped harmonic oscillator at any time is given by [a]
(a) $x = ae^{-bt}\sin\left[\left(\sqrt{(\omega^2 - b^2)}.t\right) + \phi\right]$ (b) $x = ae^{-bt}\sin\left[\left(\sqrt{(\omega^2 + b^2)}.t\right) + \phi\right]$
(c) $x = ae^{-bt}\sin\left[\left(\sqrt{(\omega^2 + b^2)}.t\right) - \phi\right]$ (d) $x = ae^{-bt}\sin\left[\left(\sqrt{(\omega^2 - b^2)}.t\right) - \phi\right]$
18. In case of forced oscillations, the displacement 'x', at any instant is given by. [d]
(a) $x = \frac{f}{\sqrt{(\omega^2 - p^2)^2 + 4b^2p^2}}\sin(pt + \theta)$ (b) $x = \frac{f}{\sqrt{(\omega^2 - p^2)^2 - 4b^2p^2}}\sin(pt + \theta)$
(c) $x = \frac{1}{\sqrt{(\omega^2 + p^2)^2 - 4b^2p^2}}\sin(pt - \theta)$ (d) $x = \frac{1}{\sqrt{(\omega^2 - p^2)^2 + 4b^2p^2}}\sin(pt - \theta)$
19. For low damping in an amplitude resonance reduced to $A_{\max} \approx \frac{f}{2bp}$ where [b]
(a) Amax = 0 as b$\rightarrow$0 (b) Amax $\rightarrow \infty$ as b$\rightarrow$0 (c) Amax $\rightarrow \infty$ as b$\rightarrow \infty$ (d) None of the above
20. Energy of damped harmonic oscillation is given by, [d]
(a) $E = 2a^2\mu e^{bt}$ (b) $E = \frac{1}{2}a^2\mu e^{2bt}$ (c) $E = 2a^2\mu e^{-bt}$ (d) $E = \frac{1}{2}a^2\mu e^{-2bt}$

II. Fill in the Blanks
1. When a body moves in such a way body its acceleration is always directed towards a fixed point and varies directly as its distance from that point, the said to execute Simple harmonic motion
2. The body which executes simple harmonic motion is called simple oscillator
3. The velocity of particle is zero at a condition, x=a is applied to obtain the value of C1 in deriving the solution of differential equation of simple oscillator.
4. The number of oscillations made in one second is called as frequency
5. The time taken for one complete oscillation is periodic time
6. When a sphere is twisted in horizontal plane an released, the pendulum starts torsional oscillations.

7. With in elastic limits the couple or torque acting on wire is proportional to angular displacement

8. If $\eta = \frac{8\pi Il}{T^2r^4}$ and $I = \frac{2}{5}mR^2$ then rigidity modulus of sphere is $\eta = \frac{16\pi MR^2 l}{5T^2r^4}$

9. The time period of simple harmonic motion in compound pendulum is calculated by the expression

$$T = \frac{2\pi}{P} = 2\pi\sqrt{\left(\frac{I}{mgl}\right)}$$

10. By knowing the value of time period T and length of equivalent simple pendulum, L g can be calculated as

$$g = \frac{4\pi^2 L}{T^2}$$

11. The phenomenon of making a body vibrate with its natural frequency under the influence of another vibrating body with the same frequency is called resonance

12. The amplitude of forced oscillations varies with the frequency of applied force and becomes maximum at a particular frequency is known as amplitude resonance

13. The difference in values of the driving frequency at which the average power absorbed falls to half of its maximum value is known as bandwidth of resonance

14. The logarithm of the ratio between the two successive maximum amplitudes which are separated by 'one period is known as logarithmic decrement

15. The rate of change of energy to the time with negative sign is known as power dissipation

16. The amplitude of the motion is continuously decreasing to the factor e-bt is known as damping factor

17. The instantaneous power 'p' absorbed by the oscillator is equal to the product of the instantaneous driving force and instantaneous velocity

18. If we displace a pendulum from its equilibrium position it will oscillate with decreasing amplitude and finally comes to rest in equilibrium position

19. The pendulums in phase and spring has the natural length throughout the motion is known as first normal mode

20. The pendulums of the coupled system swing always out of phase is known as second normal mode

III. Short Answers.
1. What is the general solution of the differential equation of damped oscillator?
2. What are free vibrations?
3. What is the general solution of the equation of forced oscillator?
4. Define resonance?
5. Give an example of over damped motion?
6. Define simple harmonic motion?
7. Mention the characteristics of SHM?
8. What are the physical characteristics f SHM?
9. Give the expression for the following. i) Displacement and ii) Acceleration of a particle executing SHM
10. Give the expression for kinetic energy and potential energy of a simple harmonic oscillator?