

Time : 03 hrs.

MM-70

General Instructions :

- a) All questions are compulsory.
 - b) There are 26 questions in total questions 1 to 5 carry one marks each, questions 6 to 10 carry two marks each question 11 to 22 carry three marks each question no. 23 is a value based question carries 4 marks and question 24 to 26 carry five marks each.
 - c) There is no overall choice. However internal choice has been provided in one question of two marks, one question of three marks and all questions of five marks each. You have to attempt only one of the given choices in such questions.
 - d) Use of calculator is not permitted.
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Section - A

- Q-1 What do you mean by Resonance during Forced Oscillation, mention its examples.
- Q-2 At what height above the Earth's surface, the value of g is same as in a mine 80 Km deep?
- Q-3 State Zeroth law of Thermodynamics using a labeled diagram.
- Q-4 A light body and a heavy body have the same Kinetic energy. which one will have the greater momentum ?
- Q-5 Find the Angle between the vectors $A = i + 2j - k$ and $B = -i + j - 2k$.

Section - B

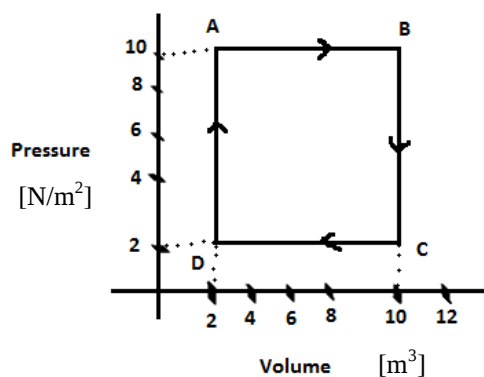
- Q-6 Define Second's Pendulum and calculate its effective length ?
- Q-7 Using Newton's law of Gravitation, define Universal Gravitational Constant $[G]$ also mention its unit & dimensional formula.
- Q-8 A column of water 40 cm high supports a 30 cm column of an unknown liquid. Find the density of liquid ? [Given that Density of water is 10^3 Kg/m^3]
- Q-9 Define vector product of two vectors. Mention its three properties.
- Q-10 What are the Transverse and longitudinal waves? Give two examples for each.

OR

What should be the minimum length of an open Organ pipe for producing a fundamental tone of frequency 110 Hz. [Given that Speed of sound is 330m/sec]

Section - C

- Q-11 Using Binomial theorem and labeled diagram, Obtain expression for variation in acceleration due to gravity with height.
- Q-12 State Archimede's principle. If a solid floats in water with $\frac{3}{4}$ of its volume below the surface of water. Calculate the density of solid. [Given that Density of water is 1000 Kg / m^3]
- Q-13 Show that the total Mechanical energy of a freely falling object remains constant throughout its fall under the effect of gravity, using labeled diagram.
- Q-14 What do you mean by degrees of freedom? Write formula for it and find degree of freedom for Helium, Oxygen and carbon dioxide-gas Molecule?
- Q-15 State and prove that Bernoulli's theorem for the steady flow of liquid using a labeled diagram.
- Q-16 A cricket ball is thrown at a speed of 28 m/sec . in a direction 30° from horizontal. Calculate
[a] The maximum height
[b] The time taken by the ball to return to the same level.
[c] The horizontal distance from the thrower to the point where the ball returns to the same level.
- Q-17 Using principle of Superposition, mathematically prove that whenever two plane progressive waves superimposing each other then affected particle of medium vibrates simple harmonically.
- Q-18 Define Conservative force, using diagram prove that Gravitational force is a conservative force.
- Q-19 What are the Stationary waves ? Prove that in case of a stretched string even and odd both type of harmonics are produced using labeled diagrams.
- Q-20 State Kepler's Laws for planetary motion and using it deduce Newton's Law of gravitation.
- Q-21 A Thermodynamic system undergoes a cyclic process ABCDA as shown in P-V diagram .
[a] Name the thermodynamic process along AB, BC, CD & DA .
[b] Calculate work done along AB, BC, CD & DA ?
[c] Find total work done in cyclic process ?



- Q-22 State Conditions for simple harmonic motion. Derive relation for velocity during S.H.M. using graphical method.

Pg.-2

OR

The shortest distance traveled by a particle executing S.H.M. from mean position in 2 seconds is equal to $\frac{\sqrt{3}}{2}$ times of its Amplitude. Determine its time -period ?

Section - D

- Q-23 In one of the demonstration experiments, one day the physics teacher in class XI took a slab of ice and supported it on two wooden blocks. He took a metallic wire and attached two heavy weights at its two ends. He placed the wire over the slab. It was seen that the wire gradually cut its way through the ice without cutting it into two pieces. The students were very happy to see this. The teacher asked his students can anyone explain what is happening. Rakesh stood and explained the Phenomenon.

[a] What are the values being displaced by Rakesh in his action ?

[b] Name the Phenomenon involved and explain it briefly?

[c] Mention two observed example in daily life.

Section - E

- Q-24 [a] Define two specific heats of gas , using P-V diagram derive a relation between specific heats of a gas .
- [b] A steam Engine delivers 5.4×10^8 Joule of work per minute and receives 3.6×10^9 Joule of heat per minute from its boiler. What is the efficiency of the Engine ? How much heat is wasted per minute ?

OR

[a] What is Latent heat ? Give its unit. With the help of a suitable graph, explain the terms latent heat of fusion and latent heat of Vapourisation.

[b] Railway lines are laid with gaps to allow for expansion. If the gap between steel rails 66 meter long be 3.63 cm at 10°C then at what temperature will the lines just touch? (Given coefficient of linear expansion of steel = $11 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$)

Q-25 [a] Define terminal velocity of a spherical object in a viscous medium and derive expression for it using a labeled diagram . Pg.-3

[b] A rain drop of radius of 3 mm falls through air with a terminal velocity of 1 meter/sec. the viscosity of air is 18×10^{-5} poise . Find the viscous force on the rain drop ?

OR

[a] Derive an expression for the height of liquid in a capillary tube using suitable labeled diagram .

[b] A U-shaped wire is dipped in a soap solution and removed, the thin soap film formed between the wire and a light slider supports a weight of 1.5×10^{-2} Newton. the length of the slider is 30 cm. Calculate the surface tension of the soap film?

Q-26 [a] Derive expression for Kinetic energy, potential energy and total Mechanical energy of a body executing Simple Harmonic Motion .

[b] The acceleration of a particle performing S.H.M. is 12 cm/sec^2 at a distance of 3 cm from the mean position. Calculate the time period of oscillation ?

OR

[a] Define Doppler's effect, Obtain expression for apparent frequency when sound source is moving towards a stationary listener .

[b] Calculate the apparent frequency of the horn of a car approaching a stationary listener with a velocity of 12 m/sec. the frequency of horn is 500 Hz and speed of the sound is 332 m / sec.
