



PHYSICS HSSC-I

22

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

NOTE: Answer any FOURTEEN parts from Section 'B' and attempts any TWO questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

SECTION - B (Marks 42)

(14 x 3 = 42)

- Q. 2 Answer any FOURTEEN parts. All parts carry equal marks.
- Briefly describe necessary conditions for SHM.
 - What is torque? Define torque as vector product of $\vec{r}$ and $\vec{F}$.
 - For $\vec{A}$ show that $|\vec{A}| = \sqrt{A_x^2 + A_y^2}$
 - Find the change in momentum for an object subjected to a given force for a given time and state law of motion in terms of momentum.
 - Two balls are projected in directions at 15° and 45° with the horizontal. If both attained the same range then find the ratio of their initial speeds.
 - Calculate the work done in kilojoules in lifting a mass of 10kg at a steady velocity through a vertical height of 10m?
 - If radius of moon is $\frac{1}{6}$ times radius of earth and gravity on moon is $\frac{1}{5}$ times gravity on earth, then find the escape velocity at the surface of moon?
 - Show that angular momentum $L = mvr$
 - Find the relation between linear velocity and angular velocity.
 - Discuss working principle of aerofoil.
 - Show that in SHM, the acceleration is zero when the velocity is greatest and the velocity is zero when the acceleration is greatest.
 - Discuss the interchanging between K.E. and P.E during SHM.
 - As a result of distant explosion, an observer senses a ground tremor and then hears the explosion. Explain the time difference in it.
 - The speed of sound in air at 0°C is 332ms^{-1} . What will be its speed at 25°C ?
 - Under what conditions two or more sources of light behave as coherent sources?
 - In Young's double slit experiment, if the distance between the slits is halved and distance between slit and screen is doubled, then find the change in fringe width?
 - A garden hose of inner radius 1.25cm carries water at 2.60ms^{-1} . The nozzle at the end has radius 0.30cm. How fast does the water emerge out through the nozzle?
 - Show that $\frac{n_o}{n_e} = \tan i_p$ (polarization of transverse waves)
 - Is it possible to convert internal energy (ΔU) into mechanical energy? Explain with an example.
 - Describe the terms 'specific heat' and 'molar specific heat' of gases.

SECTION - C (Marks 26)

(2 x 13 = 26)

- Note: Attempt any TWO questions. All questions carry equal marks.
- Q. 3 a. Explain vector and scalar products of two vectors with neat diagrams. (05)
 b. Describe two conditions of equilibrium. (04)
 c. What are the dimensions and units of gravitational constant G in the formula $F = \frac{Gm_1m_2}{r^2}$? (04)
- Q. 4 a. Explain and derive a mathematical relation for Absolute Potential Energy. (05)
 b. What is meant by moment of inertia of a body? Derive a formula for it. (04)
 c. What is the aero foils lift (in newtons) on a wing of area 88m^2 if the air passes at speed over its top surface at 280ms^{-1} and bottom surface at 150ms^{-1} ? (04)
- Q. 5 a. Explain Doppler's effect in detail with its special cases. (05)
 b. The radius of sphere 'r' is measured with a Vernier Callipers as $(r \pm \Delta r) = (2.25 \pm 0.01)\text{cm}$. Calculate the volume of sphere. (04)
 c. A Carnot engine utilizes an ideal gas. The source temperature is 227°C and sink temperature is 127°C . Find the efficiency of the engine. Also find heat input from the source and heat rejected to the sink when 10000J of work is done? (04)

Important formulae:

$$\begin{aligned}
 & \text{Fringe Spacing} = L \frac{\lambda}{D} & R &= \frac{v^2 \sin(2\theta)}{g} & \text{Work} &= \vec{F} \cdot \vec{d} & v_x &= v_o + (0.61)V & v &= r\omega \\
 & t_{\text{osc}} = \sqrt{2gR} & \text{Weight} &= mg & v_x &= x_o \sqrt{\frac{k}{m}} & \% \text{Efficiency} &= \left(\frac{T_1 - T_2}{T_1} \right) \times 100\% = \left(\frac{Q_1 - Q_2}{Q_1} \right) \times 100\%
 \end{aligned}$$

Federal Board Physics Paper 2008

Xiang Xie



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