

Note: Time allowed for section B and C is 2 hours and 40 minutes.

**SECTION "B"**

Marks: 40

I. Attempt any Ten Parts out of the following. Each Part carries equal marks.

- i. Show that the following relations are dimensionally correct. (a)  $E=mc^2$  (b)  $PE=mgh$
- ii. Define the following terms:  
(a) Unit vectors (b) Equal vectors (c) Null vector (d) Resultant vector.
- iii. An aeroplane while travelling horizontally, dropped a bomb when it was exactly above the target, the bomb missed the target. Explain.
- iv. When you release an inflated but untied balloon, why does it fly across the room.
- v. What happens to K.E of a bullet when it penetrates into a target?
- vi. Write the rotational analogue of the following.  
(a)  $F=ma$  (b)  $S=vt$  (c)  $p=mv$  (d)  $V_f = V_i + at$
- vii. Define the following terms in thermodynamics:  
System, Surroundings, Boundary, State variable.
- viii. A soap bubble looks black when it bursts, Why?
- ix. Why does the speed of a sound wave in a gas change with temperature?
- x. Define the terms viscosity and viscous drag for fluids.
- xi. Define and calculate escape velocity of a body on earth.
- xii. Write the dimensions of  
(a) Work (b) Power (c) Velocity (d) Force
- xiii. Give two examples in which resonance plays an important role.

**SECTION "C"**

Marks: 27

Note: Attempt any Three questions of the following. Each question carries equal Marks.

- III. (a) Show that the motion of simple pendulum is conditionally SHM.  
(b) A spider swings in the breeze from silk thread with a period of 0.6s. How long is the spider's strand of silk?
- IV. (a) State and explain the first law of thermodynamics.  
(b) Find the speed of sound in a steel railway track, if the density of steel is  $7800\text{kgm}^{-3}$  and Elastic modulus is  $2.0 \times 10^{11}\text{Nm}^{-2}$ .
- V. (a) Define conservative and non-conservative forces. Show that gravitational field is a Conservative field.  
(b) A garden hose of inner radius 1.25cm carries water at 2.60m/s. The nozzle at the end has radius 0.30cm. How fast does the water emerge out through the nozzle?
- VI. Write notes on any two of the following. All carry equal marks.  
(i) Stokes law (ii) Conditions for interference (iii) Angular Momentum