

SECTION 'B' (Short-Answer Questions) (32)

NOTE: Answer any NINE part questions from this section. All questions carry equal marks. Draw diagrams where necessary.

2 (i) Find the dimensions of the following.

(a) work (b) energy (c) power (d) momentum

2 (ii) Two tug boats are towing a ship each exerts a force of 6000 N , and the angle between two ropes is 60° . Calculate the resultant force on the ship?

2 (iii) State the law of conservation of momentum.

2 (iv) (a) What is the angular momentum of a 2.9 kg uniform cylindrical grinding wheel of radius 20 cm when rotating 1550 rpm ?

(b) How much torque is required to stop it in 6 s ?

2 (v) What is the law of conservation of energy?

2 (vi) In a hydraulic press a force of 20 N is applied to a piston of area 0.20 m^2 . The area of the other piston is 2.0 m^2 . What is (a) the pressure transmitted through the fluid; (b) the force on the piston?

2 (vii) Describe terminal velocity in liquids

2 (viii) An electron is liberated from the lower of two large parallel metal plates separated by a distance $h = 2\text{ cm}$. The upper plate has a potential of 2400 volts relative to the lower. How long does the electron take to reach it?

2 (ix) Derive expressions for the combined capacitance of two capacitors (a) connected in series, (b) connected in parallel.

2 (x) The storage battery of a car has an emf of 12 V . If the internal resistance of the battery is 0.50Ω , what is the maximum current that can be drawn from the battery?

2 (xi) A wire is hanging from the top of a tower such that the top is not visible due to darkness. How do you calculate the height of tower?

2 (xii) A train sounds its whistle while passing by a railroad crossing. An observer at the crossing measures a frequency of 219 Hz as the train approaches the crossing and a frequency of 184 Hz as the train leaves. The speed of the sound is 340 ms^{-1} . Find the speed of the train and frequency of its whistle.

2 (xiii) Explain why two waves of significantly different frequencies cannot be coherent?

2 (xiv) Write advantages and disadvantages of frequency modulation.

SECTION "C" (Detailed Answer Questions) (32)

NOTE: Attempt any TWO questions from this section. All questions carry equal marks. Draw diagrams where necessary.

3. (a) What are the uses of dimensional analysis? Explain each of them.

3. (b) State the law of conservation of momentum. Provide an example from everyday life that demonstrates the principle of momentum conservation.

4. (a) Define work by variable force. Calculate the work done from the force-displacement graph.

4. (b) State and explain Coulomb's law. Apply it to calculate the electric field due to an isolated point charge.

5. (a) Define simple harmonic motion (SHM). Discuss the key characteristics of a system undergoing SHM.

5. (b) Define standing waves and explain how they are formed.