

PHYSICS (Subjective) GROUP - II

Time: 02:40 Hours

Marks: 68

SECTION – I**2. Write short answers to any EIGHT parts.**

16

- Write the dimensions of pressure and density.
- Name several repetitive phenomenon occurring in nature which could serve as reasonable time standard.
- How many meters are there in one light year? Explain.
- What are the characteristics of ideal standard?
- The vector sum of three vectors gives a zero resultant. What can be orientation of the vectors?
- Can a body rotate about its center of gravity under the action of its weight?
- If $\vec{A} = 3\hat{i} - 5\hat{j}$, $\vec{B} = 7\hat{k}$, find $(\vec{A} \times \vec{B})$
- Define impulse and show that how it is related to linear momentum?
- Explain the circumstances in which the velocity $\vec{v}$ and acceleration $\vec{a}$ of a car are perpendicular to one another.
- What is the effect on the speed of a fighter plane chasing another when it opens the fire?
- When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
- Prove that $P = \vec{F} \cdot \vec{v}$

3. Write short answers to any EIGHT parts.

16

- What is the venturi relation? Which quantity is measured using this relation?
- How does swing is produced in a tennis ball?
- Two cylinders of equal mass but with different diameters, which has greater rotational inertia?
- What do you know about GPS and its use?
- What is an orbital velocity? What does effect of mass of satellite on value of orbital velocity?
- How do you find direction of angular momentum and angular velocity in simple situation?
- Why does the oscillation of a vibrating body eventually stop?
- If a pendulum vibrates with frequency 'f'. What does effect on its angular frequency, if its time period is doubled?
- What does information is determined by phase of a vibrating body?
- Describe the term crest, trough, node and antinode.
- How does the speed of distant stars and galaxies are calculated?
- In the phenomenon of stationary waves, if string vibrates in more and more loops, what would you conclude about its frequency and wavelength?

4. Write short answers to any SIX parts.

12

- What conditions must be met to observe the interference of light?
- Why the polaroid sunglasses are better than ordinary sunglasses?
- Justify that a path difference $\frac{\lambda}{4}$ is neither associated with constructive interference nor destructive interference of light.
- How the power is lost in optical fiber through dispersion? Explain.
- How the light propagates with in a flexible glass fiber?
- Describe briefly how light is refracted in continuous refraction?
- Can the mechanical energy be converted completely into heat energy? If so, give an example.
- Calculate the change in internal energy when 42J heat energy is transferred to the system during the expansion and 32J work is done on the piston.
- Does entropy of a system increase or decrease due to friction? Explain.

SECTION – II Attempt any THREE questions. Each question carries 08 marks.**5. (a) What is meant by cross product and explain its four characteristics?**

05

- (b) A 100g golf ball is moving to the right with a velocity of 20ms^{-1} . It makes a head on collision with an 8 kg steel ball, initially at rest. Compute velocities of the balls after collision.

03

6. (a) Show that frequencies of stationary waves in a stretched string are quantized.

05

- (b) A car of mass 800kg travelling at 54kmh^{-1} is brought to rest in 60 meters. Find the average retarding force on the car.

03

7. (a) Define centripetal acceleration and derive its relation.

05

- (b) A 100g body hung on a spring elongates the spring by 4.0cm. When a certain object is hung on the spring and set vibrating, its period is 0.568s. What is the mass of the object pulling the spring?

03

8. (a) Derive the relations for pressure and temperature in term of average K.E. of the molecules.

05

- (b) What gauge pressure is required in the city mains for a stream from a fire house connected to the mains to reach a vertical height of 15.0m?

03

9. (a) What is meant by diffraction of light? Also discuss the diffraction of light through a narrow slit.

05

- (b) Calculate the critical angle and angle of entry for an optical fiber having core of refractive index 1.50 and cladding of refractive index 1.48.

03