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HSSC-(P-I)-A/2024
(For All Sessions)

Paper Code	6	4	7	5

Physics (Objective)

(Group-I) RWP-1-24 Time: 20 Minutes Marks : 17

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 When temperature of air increases then the speed of sound will:
(A) Decrease (B) Increase (C) Remain same (D) Be Zero

2. The distance between first and third crest in transverse wave is:
(A) 2λ (B) 3λ (C) 4λ (D) 8λ

3. Wave front and light rays are always:
(A) Parallel (B) Perpendicular (C) Antiparallel (D) At 120°

4. The advantage of graded index fibre over the step index fibre is due to no :
(A) Refraction (B) Dispersion (C) Multiple reflection (D) Scattering

5. In the gas equation $Pv = RT$, where v represents volume of:
(A) 1 g of gas (B) 1 mole of gas (C) 1 liter of gas (D) Any mass of gas

6. If $T_1 > T_2$ then $\frac{Q}{T_2} - \frac{Q}{T_1}$ is always:
(A) Zero (B) Infinity (C) Negative (D) Positive

7. The dimension of $\sqrt{\frac{f \times l}{m}}$ is
(A) $[LT^{-3}]$ (B) $[LT^{-2}]$ (C) $[MLT^{-1}]$ (D) $[LT^{-1}]$

8. The least count of a balance A is10kg, of B is 1 kg, of C is 0.1 kg and of D is 0.01kg, which is most precise:
(A) A (B) B (C) C (D) D

9. $\hat{i} \times (\hat{j} + \hat{k})$ is equal to:
(A) 1 (B) $\vec{0}$ (C) $\hat{j} - \hat{k}$ (D) $\hat{k} - \hat{j}$

10. $\vec{A} = 5\hat{i} + 7\hat{j} - 3\hat{k}$ and $\vec{B} = 2\hat{i} + 2\hat{j} - a\hat{k}$ are perpendicular vectors, the value of 'a' is:
(A) -2 (B) 8 (C) -7 (D) -8

11. A body is moving with uniform velocity, its acceleration will be:
(A) Variable (B) Zero (C) Uniform (D) Positive

12. Which of the following can be determined by finding the slope of the tangent of the velocity time graph at a point is:
(A) Acceleration (B) Momentum (C) Displacement (D) Average velocity

13. The work done in taking a body from the floor to the table top depends on:
(A) The path taken (B) Height of the table (C) Speed of the particle (D) Time taken for work

14. "$mr\omega^2$" is an expression for:
(A) Gravitational force (B) Centripetal force (C) Newton's force (D) Apparent force

15. The rate of change of angular momentum is:
(A) Force (B) Torque (C) Pressure (D) Density

16. The terminal velocity of an object in a fluid of greater viscosity is:
(A) Large (B) Small (C) Maximum (D) Zero

17. A body performing SHM, the distance covered by body in complete vibration is 20 cm. its amplitude will be:
(A) 5 cm (B) 10 cm (C) 20 cm (D) 40 cm

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Roll No _____

HSSC-(P-I)-A-2024
(For All Sessions)

Marks : 68

Physics (Subjective)

Group-I RWP-I-24

Time: 2:40 hours

SECTION-I

2. **Write short answers of any eight parts from the following:** (8x2=16)

i. Does all physical measurements are accurate or precise, yes or not, explain.
ii. How do you calculate final uncertainty in a timing experiment?
iii. Find the dimension of coefficient of viscosity η in the relation $F = 6\pi\eta rv$.
iv. Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.
v. How do you multiply a vector by a scalar number? vi. Can the magnitude of a vector have a negative value?
vii. Can a body rotate about its center of gravity under the action of its weight?
viii. Explain the circumstances in which the velocity and acceleration of a car are (i) Parallel (ii) Anti-parallel.
ix. Define impulse and how it is related to linear momentum? x. What is meant by a ballistic missile, how it works?
xi. An object has 1J of potential energy. Explain what does it mean? How much power does it have?
xii. A girl drops a cup from certain height, which breaks into pieces. Why it happens & what energy changes are involved?

3. **Write short answers of any eight parts from the following:** (8x2=16)

i. What is meant by angular momentum? Explain the law of conservation of angular momentum.
ii. When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.
iii. Differentiate between tangential velocity and angular velocity. iv. Prove that $2\,radian = 114.6^{\circ}$
v. A person is standing near a fast moving train. Is there any danger that he will fall towards it?
vi. What are systolic and diastolic pressures? vii. Does frequency depend on amplitude for harmonic oscillators?
viii. What is meant by phase angle? Does it define angle between maximum displacement and the driving force?
ix. Show that when a pendulum moves from mean position to half of amplitude, time taken by it is, $t = T/12$.
x. A wave is produced along a stretched string but some of its particles permanently show zero displacement .What type of wave is it?
xi. Why does sound travels faster in solids than in gases?
xii. Find the temperature of air, if the velocity of sound is $340\ ms^{-1}$ at the temperature.

4. **Write short answers of any six parts from the following:** (6x2=12)

i. Under what conditions two or more sources of light behave as coherent sources?
ii. How would you manage to get more orders of spectra using a diffraction grating?
iii. What is graphical representation of diffraction pattern of monochromatic light produced due to to a single slit?
iv. What do you understand by linear magnification and angular magnifications?
v. How power is lost in optical fiber through dispersion? Explain. vi. Name the parts of a spectrometer?
vii. Does entropy of a system increases or decreases due to friction?
viii. Is it possible to construct a heat engine that will not expel heat into the atmosphere?
ix. Draw a PV-diagram in case of isothermal process and adiabatic process.

SECTION-II

Note **Attempt any three questions. Each question carries equal marks:** (8x3=24)

5. (a) Drive the expression for the final velocities of two hard smooth balls after their elastic collision in one dimension. (5)
(b) Find the angle between the two vectors. $\bar{A} = 5\hat{i} + \hat{j}$ and $\bar{B} = 2\hat{i} + 4\hat{j}$ (3)

6. (a) Which field is produced by the earth? Prove that the work done in this field is independent of the path followed and work done in a closed path be zero. (5)
(b) A stationary wave is established in a string which is 120cm long and fixed at both ends. The string vibrates in four segments, at a frequency of 120 Hz. Determine its wavelength and fundamental frequency. (3)

7. (a) What is resonance phenomenon ? Explain it with examples. (5)
(b) A gramophone record turntable accelerates from rest to an angular velocity of 45.0 rev / min in 1.60 seconds. What is the average angular acceleration. (3)

8. (a) How does the pressure of a gas in a container is directly proportional to average translational kinetic energy. (5)
(b) An airplane wing is designed so that when the speed of the air across the top of the wing is $450ms^{-1}$, the speed of air below the wing is $410ms^{-1}$. What is the pressure difference between the top & bottom of the wings? (Density of air $=1.29kgm^{-3}$) (3)

9. (a) Discuss Michelson's interferometer in detail. (5)
(b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24cm apart. Find focal lengths of lenses. (3)

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HSSC-(P-I)-A/2024

(For All Sessions)

(Group-II)

Paper Code	6	4	7	6

RWP-2-24

Physics (Objective)

Time: 20 Minutes Marks : 17

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 The location of submarines can be detected by:

(A) Doppler effect (B) Compton's effect (C) Photoelectric effect (D) Temperature effect

2. The speed of sound is greater in:

(A) Oxygen (B) Air (C) Water (D) Copper

3. The property of bending of light around obstacles is:

(A) Reflection (B) Refraction (C) Diffraction (D) Polarization

4. Magnifying power of telescope is:

(A) $\frac{fe}{fo}$ (B) $\frac{fo}{fe}$ (C) $fefo$ (D) $\frac{1}{fefo}$

5. $W = -\Delta U$ equation holds for:

(A) Isothermal (B) Adiabatic (C) Isochoric (D) Isobaric

6. The efficiency of carnot engine depends on:

(A) Working substance (B) T_1 (C) T_2 (D) T_1 & T_2

7. The number of significant figures in 0.00232 are:

(A) 6 (B) 5 (C) 4 (D) 3

8. Light year is the unit of:

(A) Light (B) Distance (C) Time (D) Velocity

9 The relation $\bar{A} + (-\bar{A})$ results the:

(A) Null vector (B) Parallel vector (C) Unit vector (D) Position vector

10 Unit vector for a vector $\bar{A} = 4\hat{i} + 3\hat{j}$ is:

(A) $\frac{4\hat{i} + 3\hat{j}}{25}$ (B) $\frac{25}{\sqrt{4\hat{i} + 3\hat{j}}}$ (C) $\frac{4\hat{i} + 3\hat{j}}{5}$ (D) $\sqrt{\frac{5}{4\hat{i} + 3\hat{j}}}$

11 The horizontal range of projectile at 30°C with horizontal is same as that at an angle of:

(A) 45° (B) 60° (C) 90° (D) 120°

12. The mass of fuel consumed by a typical rocket to overcome earth's gravity is:

(A) $10\ Kgs^{-1}$ (B) $100\ Kgs^{-1}$ (C) $10000\ Kgs^{-1}$ (D) $1000\ Kgs^{-1}$

13. The work is said to be negative if:

(A) $\theta = 0^\circ$ (B) $\theta = 90^\circ$ (C) $\theta > 90^\circ$ (D) $\theta < 90^\circ$

14. The relation for moment of inertia of sphere is:

(A) $\frac{2}{5}mr^2$ (B) $\frac{5}{2}mr^2$ (C) $\frac{1}{2}mr^2$ (D) $2mr^2$

15. If $1\ rad = 57.3^\circ$ then ½ rad is:

(A) 57.3° (B) 28.65° (C) 180° (D) 360°

16. The pressure will be low when the speed of fluid is:

(A) High (B) Low (C) Zero (D) Constant

17. The acceleration of a body executing SHM depends upon its:

(A) Time period (B) Amplitude (C) Frequency (D) Displacement

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(For All Sessions)

Marks : 68

Physics (Subjective)

Group-II

RWP-2-24

Time: 2:40 hours

Section-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. Write the dimension of (i) Pressure (ii) Density.
ii. What are the dimension and unit of $\sqrt{\frac{F \times l}{m}}$?
iii. What are supplementary units? Define only one unit.
iv. Give the drawbacks to use the period of a pendulum as a time standard.
v. Two vectors have unequal magnitudes. Can their sum be zero? Explain.
vi. Under what circumstances would a vector have components that are equal in magnitude?
vii. If $\vec{A} = 3\hat{i} - 5\hat{j}$, $\vec{B} = 7\hat{k}$ find $(\vec{A} \times \vec{B})$
viii. What is ballistic missile? Define its trajectory.
ix. Show that the area between the velocity time graph is numerically equal to the distance covered by the object.
x. Explain what is meant by projectile motion. Derive expression for the time of flight.
xi. What is the solar constant and what is its value?
xii. Calculate the work done in kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10m.

3. Write short answers of any eight parts from the following: (8x2=16)

i. Show that orbital angular momentum, $L_0 = mvr$.
ii. How can you describe angular equations of motion analogous with linear equations of motion?
iii. Prove that, $\theta = \frac{s}{r}$ radian.
iv. Can centripetal force perform any work? Explain.
v. Fog droplet appears to be suspended in air. Why?
vi. How an airplane is lifted up in the air?
vii. Does the acceleration of a simple harmonic oscillator remains constant during its motion? Is the acceleration ever zero? Explain.
viii. Why in S.H.M the acceleration is zero when the velocity is greatest?
ix. Prove the relation $U = f\lambda$
x. Calculate the formula of the time period of a mass attached to a spring.
xi. As a result of a distant explosion an observer senses a ground tremor & then hears the explosion. Explain the time difference.
xii. What will be effect on speed of sound if the temperature of the gas through which it passes increases to three times keeping the pressure of the gas constant?

4. Write short answers of any six parts from the following: (6x2=12)

i. Can visible light produce interference fringes? Explain.
ii. How would you manage to get more orders of spectra using a diffraction grating?
iii. When mirror M_1 of Michelson interferometer is moved a distance 0.5 mm, 200 fringes are observed, then calculate the wavelength of light used.
iv. Explain the difference between angular magnification and resolving power of an optical instrument.
v. How the power is lost in optical fibre through dispersion? Explain
vi. What is meant by length of the telescope? Explain.
vii. Why does the pressure of a gas in a car type increase when it is driven through some distance?
viii. A thermos flask containing milk as a system is shaken rapidly. Does the temperature of milk rise?
ix. Does the efficiency of Carnot engine depends on the nature of working substance? Explain it.

SECTION-II

Note **Attempt any three questions. Each question carries equal marks:** (8x3=24)

5. (a) Define vector product and also discuss torque as an example of vector product in detail. (5)
(b) Two blocks of masses 2.0 kg and 0.50 kg are attached at the two ends of a compressed spring. The elastic potential energy is stored in the spring is 10J. Find the velocities of the block if the spring delivers its energy to blocks when released. (3)

6. (a) How would you derive a relation for the effect of temperature on the speed of sound in a gas? (5)
(b) A 70 kg man runs up a long flight of stairs in 4.0 sec. The vertical height of the stairs is 4.5 m. calculate his power output in watts. (3)

7. (a) Prove that energy is conserved in simple harmonic motion. (5)
(b) A 1000 kg car travelling with a speed of $144\ kmh^{-1}$ round a curve of radius 100m. Find the necessary centripetal force. (3)

8. (a) State first law of thermodynamics and explain (i) Isothermal process (ii) Adiabatic process. (5)
(b) Water flows through a hose, whose internal diameter is 1 cm at a speed of 1m/s . What should be the diameter of the nozzle if the water is to emerge at 21 m/s? (3)

9. (a) Explain the construction and working of an astronomical telescope. Also derive a relation for its magnifying power. (5)
(b) A light is incident normally on a grating which has 2500 lines per centimeter. Compute the wavelength of the spectral line for which the deviation in second order is 15.0° (3)