Physics (Objective Type)

(For all Sessions)

| Paper Code | 6 | 4 | 7 | 1 |

Time: 20 Minutes

Group-I RuR GI-22   **Marks:17**

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1.
1. The fractional uncertainty in the measurement of radius $r = 2.25 \pm 0.01 cm$ is:

   (A) 0.4   (B) 0.04   (C) 0.004   (D) 0.0004

2. The dimensions of pressure are:

   (A) $\left[ML^{-1}T^{-2}\right]$ (B) $\left[MLT^{-2}\right]$ (C) $\left[ML^2T^{-2}\right]$ (D) $\left[ML^{-1}T^{-1}\right]$

3. The projection of $\vec{A}$ in the direction of $\vec{B}$ is:

   (A) $BCos\theta$ (B) $ABCos\theta$ (C) $ACos\theta$ (D) $ASin\theta$

4. Dot product of two antiparallel vectors $\vec{A}$ and $\vec{B}$ is:

   (A) $AB\cos\theta$ (B) AB   (C) 0   (D) -AB

5. The two masses m_1 and m_2 will interchange their velocities after collision if:

   (A) $m_1 >> m_2$ (B) $m_1 = m_2$ (C) $m_2 >> m_1$ (D) m_2 is at rest

6. Kg ms^{-1} is the SI unit of:

   (A) Force   (B) Momentum   (C) Energy   (D) Power

7. The work done is said to be negative if:

   (A) Work is always positive   (B) $\theta < 90^o$
   (C) $\theta > 90^o$ (D) $\theta = 90^o$

8. When a body attains its terminal velocity, the acceleration of body becomes.

   (A) Zero   (B) equal to g   (C) maximum   (D) equal to -g

9. Moment of intertia of sphere is

   (A) mr^2 (B) $\frac{1}{2}mr^2$ (C) $\frac{2}{3}mr^2$ (D) $\frac{2}{5}mr^2$

10. The low flying earth satellites have acceleration:

    (A) 9.8 m/s^2 (B) 4.9 m/s^2 (C) 10 m/s^2 (D) 7.9 m/s^2

11. When a quarter of the cycle is completed, the phase of vibration is.

    (A) $2\wedge rad$ (B) $\frac{\wedge}{2} rad$ (C) $3\wedge/2 \, rad$ (D) $\wedge rad$

12. For each degree rise in temperature of air, the speed of sound through it rises by:

    (A) 0.60 cm/s   (B) 0.61 m/s   (C) 0.61 cm/s   (D) 0.60 m/s

13. If organ pipe is open at both ends, then the frequency of fundamental note is:

    (A) $v/2l$ (B) v/l (C) $v/4l$ (D) $4v/l$

14. If blue light is used instead of red light, the fringe spacing:

    (A) Increases   (B) Disappears   (C) Remains same   (D) Decreases

15. If magnifications of objective lens and eye – piece are 4 ad 5 respectively, then the magnification of compound microscope will be:

    (A) 9   (B) 20   (C) 1   (D) 10

16. Average kinetic energy of molecules of a gas gives.

    (A) Heat energy   (B) Work done   (C) Internal energy   (D) Entropy

17. If temperature of sink is decreased, the efficiency of Carnot engine.

    (A) Decreases   (B) Increases
    (C) Remains same   (D) May increase or decrease

Physics (Essay Type)   (For All Sessions)
Time: 2:40 Hours   Group-I   Marks: 68

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.

SECTION – I RwP-G1-22

2. Write short answers to any EIGHT questions.   (2 x 8 = 16)
 i.   Name several repetitive phenomenon which could serve as reasonable time standards.
 ii. Give the drawbacks to use the period of pendulum as time standard.
 iii. Check the correctness of $v = \sqrt{\dfrac{F \times l}{m}}$ where v is speed of transverse wave on a stretched string of tension F, length l and mass m.
 iv. Define base units and name all SI base units.
 v.   At which angle of projection a projectile for which its maximum height and horizontal range are equal.
 vi. What are objectives of velocity time graph.
 vii. Motion with constant velocity is a special case of constant acceleration. Is this statement true? Discuss.
 viii. Define impulse and how it is related to linear momentum.
 ix. Why the pressure of a car tyre increase when it is driven through some distance.
 x.   Is it possible to convert internal energy into mechanical energy. Explain with an example.
 xi. Give an idea of working refrigerator.
 xii. Can mechanical energy be converted into heat energy? If so give an example.

3. Write short answers to any EIGHT questions.   (2 x 8 = 16)
 i.   Two vectors have unequal magnitudes. Can their sum be zero? Explain.
 ii. Define the terms unit vector and position vector.
 iii. Explain the addition of two vectors by head to tail rule.
 iv. Define conservative field and give example.
 v.   Explain fermentation process to get energy from biomass.
 vi. An object has 1J of potential energy. Explain what does it mean?
 vii. Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission.
 viii. What is meant by moment of inertia? Explain its significance.
 ix. Prove that 1rad = 57.3°.
 x.   What is meant by wave fronts?
 xi. Under what conditions two or more sources of light behave as coherent sources?
 xii. An oil film spreading over a wet footpath shows colours. Explain how does it happen.

4. Write short answers to any SIX questions.   (2 x 6 = 12)
 i.   A person is standing near a fast moving train. Is there any danger that he will fall towards it?
 ii. Does the acceleration of a simple harmonic oscillator remains constant during its motion? Is the acceleration zero? Explain.
 iii. What is resonance? Give one application.
 iv. Give an application of damped oscillations.
 v.   Why does sound travel faster in solids than in gases?
 vi. What is meant by blue shift in dopplers effect?
 vii. How beats are useful in turning a musical instrument?
 viii. Why a convex lens of shorter focal length is preferred for a magnifying glass?
 ix. How the power is lost in optical fibre through dispersion? Explain.

SECTION – II

Note: Attempt any THREE (3) questions from Section II.

5. (a) Define vector product of two vectors. Show that it is non commutative. Also write any four characteristics.   (5)
 (b) A car of mass 800 kg travelling at 54 Kmh⁻¹ is brought to rest in 60 meters. Find the average retarding force. What has happened to original K.E?   (3)

6. (a) Define centripetal force. Derive a relation for centripetal force on a body of mass m moving with velocity v in a circle of radius r.   (5)
 (b) A ball is thrown horizontally from a height of 10m with velocity of 21m/s. How far off it hit the ground and with what velocity?   (3)

7. (a) State and prove equation of continuity using Law of conservation of mass.   (5)
 (b) A church organ consists of pipes, each open at one end of different lengths. The minimum length is 30cm and longest is 4m. Calculate the frequency range of fundamental notes. Speed of sound = 340ms⁻¹   (3)

8. (a) Derive the expression for time period, displacement and velocity of horizontal mass spring system.   (5)
 (b) A monochromatic light of $\lambda = 588nm$ is allowed to fall on the half silvered glass plate G1, in Michelson interferometer. If mirror M1 is moved through 0.233 mm, how many fringes will be observed to shift?   (3)

9. (a) Draw ray diagram of a compound microscope and derive expression for its magnification.   (5)
 (b) A heat engine perform 100 J of work and at the same time rejects 400 J of heat energy to the cold reservoirs. What is the efficiency of the engine?   (3)

Roll No. _____ to be filled in by the candidate.

Inter. (Part-I)-A-2022

(For all Sessions)

Paper Code | 6 | 4 | 7 | 4

Physics (Objective Type)

Time: 20 Minutes

Group-II RUP-52-22 **Marks:17**

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1. 1. Venturi meter is a device used to measure:

   (A) Pressure of fluid   (B) speed of fluid   (C) Density of fluid   (D) Viscosity of fluid

2. 1 radian is equal to:

   (A) $45°$ (B) $60°$ (C) $57.3°$ (D) $73.3°$

3. If moment of inertia of a body becomes double, then angular momentum becomes:

   (A) One half   (B) Doubled   (C) Three times   (D) Four times

4. The product of frequency (f) and time period (T) is equal to:

   (A) 2.5   (B) 0.5   (C) 2   (D) 1

5. If organ pipe is open at both ends, the frequency of fundamental harmonic is:

   (A) $\frac{v}{2l}$ (B) $\frac{2v}{l}$ (C) $\frac{v}{4l}$ (D) $\frac{4v}{l}$

6. The speed of sound in air is 332 m/s at $0C°$. Its speed at $2C°$ is:

   (A) 331.22 m/s   (B) 332.22 m/s   (C) 333.22 m/s   (D) 332 m/s

7. Colourful pattern produced by a thin soap film is due to _____ of light:

   (A) dispersion   (B) polarization   (C) diffraction   (D) interference

8. Magnification of simple microscope can be expressed as:

   (A) $1 + f/d$ (B) $1 - f/d$ (C) $1 + d/f$ (D) $1 - f/d$

9. For an adiabatic process, first law of thermodynamics takes the form:

   (A) $Q = \Delta U + W$ (B) $Q = W$ (C) $Q = \Delta U$ (D) $W = -\Delta U$

10. If the temperature of sources is two times the temperature of sink, the efficiency of heat engine will be:

   (A) 0.2   (B) 0.3   (C) 0.5   (D) 1

11. $\left[M^0 L T^{-2} \right]$ are the dimensions of:

   (A) Force   (B) Velocity   (C) Pressure   (D) Acceleration

12. The number 0.00320 can be expressed in scientific notation as:

   (A) 3.20×10^{-2} (B) 3.20×10^{-4} (C) 3.20×10^{-3} (D) 3.20×10^{3}

13. $(\hat{i} \times \hat{j}) \cdot \hat{k}$ is equal to:

   (A) 1   (B) 0   (C) $\hat{i}$ (D) $\hat{K}$

14. Cross product of two antiparallel vectors $\vec{A}$ and $\vec{B}$ is:

   (A) $AB\cos\theta$ (B) AB (C) 0   (D) -AB

15. The quantity impulse has the same units as that of:

   (A) Force   (B) Momentum   (C) Power   (D) Work done

16. The speed of the gases ejected by a typical rocket is:

   (A) 3900 m/s   (B) 4100 m/s   (C) 4000 m/s   (D) 4200 m/s

17. Which force is non – conservative force?

   (A) Gravitational   (B) Frictional   (C) Electric   (D) Magnetic

Note: Section I is compulsory. Attempt any THREE (3) questions from Section II.

SECTION – I   RwR 92-22

2. Write short answers to any EIGHT questions.   (2 x 8 = 16)

i.   What are rule for zero to be a significant figure?

ii.   What are dimensions of angular momentum and torque?

iii. A light year is distance light travel in one year. How many meters are there in one light year? (speed of light = 3×10^8 ms^{-1})

iv.   How many seconds are in one year?

v.   Can velocity of an object reverse direction when acceleration is constant? If so, give an example.

vi.   Find change in momentum for an object subjected to a given force for a given time and state law of motion in terms of momentum.

vii. Find angle of projection of a projectile when its horizontal range is twice the maximum height.

viii. Derive Newton's 1st Law of motion from the second Law of motion.

ix.   What are environmental crisis we are facing due to direct impact of thermodynamics.

x.   Prove that $<v^2> = \frac{3P}{l}$

xi.   Explain that the average velocity of molecules in gas is zero but average of the square of velocities is not zero.

xii. Give an example of process in which no heat is transferred to or from the system but the temperature of system changes.

3. Write short answers to any EIGHT questions.   (2 x 8 = 16)

i.   If all the components of the vectors $\vec{A_1}$ and $\vec{A_2}$ were reversed, how would this alter $\vec{A_1} \times \vec{A_2}$

ii.   How would you keep torque constant by varying moment arm and force. Support your answer with reasons.

iii. What data would you use to evaluate maximum cross product with minimum dot product and vice versa?

iv.   A boy uses catapult to throw a stone which accidentally smashes a green house window. List the possible energy changes.

v.   What is the special case of law of conservation of energy? Support your reason with an equation.

vi.   Define escape velocity. Which one of the planet has the highest value of escape velocity?

vii. Show that orbital angular momentum Lo = mvr

viii. Determine the rotational KE of a disc.

ix.   How would you made a distinction between spin angular momentum and orbital angular momentum? Support you distinction by considering the moment of inertia of a body.

x.   Why the polaroid sun glasses are better than ordinary sun glasses?

xi.   What is the precision of Michelson's interferometer and how Michelson redefine meter with his experiment.

xii. Why the central spot of Newton's rings is dark? Also make a diagram of this experiment.

4. Write short answers to any SIX questions.   (2 x 6 = 12)

i.   Two row boats moving parallel in the same direction are pulled towards each other. Explain.

ii.   What is the total distance travelled by an object moving with SHM in a time equal to its period, if its amplitude is A?

iii. What is Second Pendulum? Find its frequency.

iv.   What is meant by sharpness of resonance?

v.   Explain why sound travels faster in warm air than in cold air?

vi.   What is the Principle of super position?

vii. What is effect of temperature on speed of sound?

viii. How the power is lost in optical fibre through dispersion? Explain.

ix.   What is least distance of distinct vision?

SECTION - II

Note: Attempt any THREE (3) questions from Section II.

5. (a) Define torque. Explain in the case of rigid body.   (5)

   (b) How large a force is required to accelerate an electron (m = 9.1×10^{-31} Kg) from rest to a speed of 2.0×10^7 ms^{-1} through a distance of 5.0cm?   (3)

6. (a) Define artificial gravity and prove the relation $f = \frac{1}{2\pi}\sqrt{\frac{g}{R}}$ (5)

   (b) A hose pipe ejects water at a speed of 0.3 ms^{-1} through a hole of area 50cm^2. If the water strikes a wall normally, calculate the force on the wall, assuming the velocity of water normal to the wall is zero after striking.   (3)

7. (a) Derive Bernoulli's equation for an ideal fluid. Also state Bernoulli's relation.   (5)

   (b) The wave length of signals from a radio transmitter is 1500m and the frequency is 200 KHz. What is the wavelength for a transmitter operating at 1000 KHz and with what speed the radio waves travel?   (3)

8. (a) Describe the principle, construction and working of "Michelson's interferometer". How can you find the wave length of monochromatic source of light?   (5)

   (b) A load of 15.0 g alongates a spring by 2.0 cm. If body of mass 294 g is attached to the spring and is set into vibrations with an amplitude of 10.0 cm. What will be its time period?   (3)

9. (a) Describe the construction and working of compound microscope. Also derive the relation for its magnifying power.   (5)

   (b) The turbine in a steam power plant takes steam from a boiler at 427°C and exhausts into a low temperature reservoir at 77°C. What is the maximum possible efficiency?   (3)