Roll No _____ (To be filled in by the candidate) **(Academic Sessions 2019 – 2021 to 2022 – 2024)**

PHYSICS 223-1st Annual-(INTER PART – I) Time Allowed : 2.40 hours

PAPER – I (Essay Type) GROUP – II Maximum Marks : 68

SECTION – I

2. Write short answers to any EIGHT (8) questions : **16**

(i) Give four conventions for indicating units.

(ii) What is random error? How it can be eliminated?

(iii) Why do we find it useful to have two units for the amount of substance, the kilogram and mole?

(iv) Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression? Explain.

(v) How would you verify that the dot and cross product become equal in magnitude?

(vi) If all the components of the vectors $\vec{A}_1$ and $\vec{A}_2$ were reversed, how would this alter $\vec{A}_1 \times \vec{A}_2$?

(vii) Name three different conditions that could make $\vec{A}_1 \times \vec{A}_2 = \vec{0}$

(viii) Does a moving object has impulse? Explain your reasoning.

(ix) A 1500 kg car has its velocity reduced from 20 m/s to 15 m /s in 3.0 second. How large was the average retarding force?

(x) Define impulse and show that how it is related to linear momentum?

(xi) Why isolated system is important to conserve linear momentum? Also state law of conservation of momentum.

(xii) Why fog droplets appear to be suspended in air?

3. Write short answers to any EIGHT (8) questions : **16**

(i) When a rocket re-enters the atmosphere, its nose cone becomes very hot? Where does this heat energy come from?

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

(iii) State work-energy principle.

(iv) What is meant by moment of inertia? Explain its significance.

(v) Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V. transmission?

(vi) Differentiate between tangential velocity and angular velocity.

(vii) What happens to the period of simple pendulum, if its length is doubled? What happens if the suspended mass is doubled?

(viii) What is meant by phase angle? Does it define angle between maximum displacement and the driving force?

(ix) Differentiate between transverse waves and longitudinal waves.

(x) What should be the frequency of a simple pendulum whose period is 0.5 seconds at a place where $g = 9.8 ms^{-2}$?

(xi) A wave is produced along a stretched string but some of its particles permanent show zero displacement. What type of wave is it?

(xii) Explain why sound travels faster in warm air than in cold air?

(Turn Over)

4. Write short answers to any SIX (6) questions : 12

(i) Under what condition 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) Draw an interference pattern formed with white light.

(iv) Why would it be advantageous to use blue light with a compound microscope?

(v) Draw ray diagram of compound microscope and write its total magnification.

(vi) Is it possible to construct a heat engine that will not expel heat into the atmosphere?

(vii) Can mechanical energy be converted completely into heat energy? If so give an example.

(viii) Derive the Charles's law from kinetic theory of gases.

(ix) What is adiabatic process? Write down its two examples.

SECTION – II

Note : Attempt any THREE questions.

5. (a) Define rectangular component. Explain addition of vectors by rectangular components. 5

(b) Ten bricks, each 6.0 cm thick and mass 1.5 kg lie flat on a table. How much work is required to stack them one on the top of another? 3

6. (a) Define projectile motion. Derive the expression for :
(i) Time of flight and (ii) Height of a projectile. 5

(b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0 km radius so that there will be no tendency for the pilot to fall down at the highest point. 3

7. (a) Show that pressure exerted by the gas is directly proportional to the average translational kinetic energy of gas molecules. 5

(b) Water flows through a hose, whose internal diameter is 1 cm at a speed of $1ms^{-1}$. What should be the diameter of the nozzle if the water is to merge at $21ms^{-1}$? 3

8. (a) Describe Doppler's Effect. Derive apparent frequency and discuss its results if : 5
(i) Source is moving towards the stationary observer.
(ii) Source is moving away from stationary observer.

(b) Find the amplitude and frequency of an object vibrating at the end of a spring, if the equation for its position, as a function of time is $X = 0.25\cos\left(\frac{\pi}{8}\right)t$ 3

9. (a) Describe the principle, construction and working of Michelson's interferometer. How can you find the wavelength of light used? 5

(b) A compound microscope has lenses of focal length 1.0 cm and 3.0 cm. An object is placed 1.2 cm from the object lens. If a virtual image is formed, 25 cm from the eye, calculate the separation of the lenses and the magnification of the instrument. 3