

General Instructions:

- i) All parts are compulsory.
- ii) Answers without relevant diagram/figure wherever necessary will not carry any marks.
- iii) Numerical problems solved without writing the relevant formulae carry no marks.

PART - A**I Answer ALL the following questions.****10×1=10**

- 1) What is the basis of cesium atomic clock?
- 2) Which component of velocity is constant in a Projectile motion?
- 3) Define inertia.
- 4) State work - Energy theorem.
- 5) Mention the relation between Torque and angular momentum of a particle.
- 6) What are Elastomers?
- 7) State Bernoulli's principle.
- 8) How does viscosity of a liquid changes with rise in temperature?
- 9) Mention the significance of zeroth law of thermodynamics.
- 10) How does an average Kinetic Energy of gas Molecules depend on the absolute temperature?

PART - B**II Answer any FIVE of the following questions.****5×2=10**

- 11) Write any two fundamental forces in nature.
- 12) Mention any two sources of systematic errors.
- 13) Distinguish between path length and displacement.
- 14) Define the terms i) Null vector or Zero vector ii) Unit vector
- 15) Classify the nature of flow of liquid on the basis of Reynold's number
- 16) Give Kelvin-planck statement and clausius statement.
- 17) What are free Oscillations and forced oscillations?
- 18) What are Longitudinal waves and Transverse waves?

PART - C**III Answer any FIVE of the following questions.****5×3=15**

- 19) Obtain an Expression for time of flight of a projectile.
- 20) What is Friction? Write any two advantages of friction.
- 21) What is collision? Distinguish between Elastic collision and Inelastic collision.
- 22) State Kepler's law of planetary motion.
- 23) Draw a typical Stress-Strain curve for a metal. Mention yield point and Fracture point.
- 24) Show that volume coefficient of thermal expansion $\alpha_v = \frac{1}{T}$ for ideal gas at constant pressure.
- 25) Mention any three assumptions of kinetic theory of gases.
- 26) Discuss modes of vibration of air column in a closed pipe.

(P.T.O.)

PART - D

IV Answer any TWO of the followings

2×5=10

- 27) What is Uniform Circular Motion? Obtain an expression for centripetal acceleration.
- 28) Obtain an expression for maximum safe speed of a vehicle on a banked road in circular motion.
- 29) State and explain parallel axes theorem and perpendicular axes theorem.

V Answer any TWO of the following

2×5=10

- 30) Obtain an expression for total energy of a satellite revolving in circular orbit around a planet.
- 31) Explain different stages of Carnot's cycle with P-V- diagram.
- 32) Derive an expression for time period of oscillating bob of simple pendulum.

VI Answer any THREE of the following.

3×5=15

- 33) From a balloon ascending with a velocity of 9.8 ms^{-1} , a stone was dropped and it reached the ground in 11s. How high was the balloon. When the stone was dropped and with what velocity did it hit the ground. ($g = 9.8 \text{ ms}^{-2}$)
- 34) A pump on the ground floor of a building can pump up water to fill a tank of volume 30 m^3 in 15 min. If the tank is 40m above the ground and efficiency of the pump is 30%. How much power is consumed by the pump. (Density of water 10^3 kg m^{-3} , $g=9.8 \text{ ms}^{-2}$)
- 35) A dental drill accelerates from rest to 900 rpm in 2 sec. What is the angular acceleration. How many revolutions does it make in coming to full speed.
- 36) Find the time for which a layer of ice 5 cm thick on the surface of a pond will increase its thickness by 0.1 cm when temperature of the surrounding air is -20°C .

Thermal conductivity of ice = $2.1 \text{ W m}^{-1} \text{ K}^{-1}$

density of ice = 900 Kg m^{-3}

Latent heat of ice = $3.36 \times 10^5 \text{ J Kg}^{-1}$

- 37) Two cars are approaching each other on a straight road and moving with a velocity 60 Kmph. If the sound produced in one car is of frequency 500Hz. What will be the frequency of sound as heard by a person sitting in another car. When the car has crossed and moving away from each other, what will be the frequency of sound as heard by the same person. (speed of sound in air is 332 ms^{-1}).