

NOTE: There are three sections of this paper. Carefully read the instructions for each section and attempt accordingly. Attempt all questions of Section-A and return it to the Superintendent within given time, even if you have not attempted any question. Select the correct choice and write only A, B, C or D, whichever is appropriate, in the answer box. No marks will be awarded for cutting/erasing or overwriting.

**SECTION-A**

Time: 20 Minutes

Marks: 18

1. In the measurement 1000.0 kg, the number of significant figures is: A) 1, B) 3, C) 4, D) 5 .....  D
2. The magnitude of relative error helps to measure the: A) precision of a measurement, B) accuracy of a measurement, C) both A&B, D) none of these .....  B
3. Commutative law is obeyed by: A) subtraction of vectors, B) addition of vectors, C) cross-product of two vectors, D) all of these .....  B
4. What is the angle between  $\vec{A}$  and  $\vec{B}$  for which  $|\vec{A} - \vec{B}| = |\vec{A} \times \vec{B}|$ ? A)  $30^\circ$ , B)  $45^\circ$ , C)  $60^\circ$ , D)  $90^\circ$  .....  B
5. For a body, if the velocity-time graph is a straight line parallel to the time axis, acceleration is: A) positive, B) negative, C) zero, D) variable .....  C
6. For which of the following pairs of angles, a projectile has the same range? A)  $30^\circ$ ,  $70^\circ$ , B)  $25^\circ$ ,  $65^\circ$ , C)  $30^\circ$ ,  $60^\circ$ , D)  $10^\circ$ ,  $90^\circ$  .....  B
7. In British Engineering system the unit of power is called horse power and numerically 1 hp is equal to: A) 746 watt, B) 74.6 watt, C) 7.46 watt, D) 0.746 watt .....  A
8. The atmosphere is held to the earth by: A) winds, B) gravity, C) clouds, D) the rotation of earth .....  B
9. A hoop, rolling down on a frictionless inclined plane has 20 joules K.E of rotation, its K.E of translation will be: A) 10 J, B) 20 J, C) 30 J, D) 40 J .....  B
10. Drag force produces: A) positive acceleration, B) negative acceleration, C) no acceleration, D) none of these .....  B
11. At resonance, the amplitude of vibration becomes very large when damping is: A) small, B) medium, C) heavy, D) all these .....  A
12. The time period of a simple pendulum is 2 seconds. If its length is increased by 4 times, then its period becomes: A) 16 sec, B) 12 sec, C) 8 sec, D) 4 sec .....  D
13. A wave generator produces 500 pulses in 10 seconds. The period of the generator is: A) 2 sec, B) 0.2 sec, C) 0.02 sec, D) 0.002 sec .....  C
14. Which one of the following factors has no effect on the speed of sound in a gas? A) humidity, B) pressure, C) temperature, D) density .....  B
15. The principle of Young's double slits experiment is based on the division of: A) amplitude, B) frequency, C) velocity, D) wavelength .....  D
16. The tip of a needle does not give a sharp image. It is due to: A) polarization, B) interference, C) diffraction, D) refraction .....  C
17. The latent heat of fusion of ice in SI units is: A) 336, B) 3360, C) 336000, D) 36800 .....  C

Time: 2 Hours 40 Minutes

### SECTION-B

Marks: 40

1. Attempt any ten of the following. All carry equal marks.
  - i. What does dimension of a physical quantity mean? Explain what are its applications and limitations?
  - ii. Explain with the help of an example, what is the range of possible values of the resultant of two vectors?
  - iii. Explain why do buses and heavy trucks have large steering wheels?
  - iv. Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss.
  - v. State and explain the law of conservation of linear momentum.
  - vi. A man rowing boat upstream is at rest with respect to shore. Is he doing work? Explain.
  - vii. When an arrow is shot from its bow, it has K.E. From where does it get the K.E?
  - viii. Is it possible for a person to distinguish between raw egg and a hard boiled one by spinning each on a table? Explain.
  - ix. Why does the pipe of a paper squeeze when air is blown through it?
  - x. What is simple pendulum? Show that motion of simple pendulum is SHM.
  - xi. Discuss the effects of various factors on speed of sound in air.
  - xii. Derive the Bragg's law. What is the significance of this law?
  - xiii. Why does the pressure of the air in automobile tyre increase if the automobile is driven for a while?

### SECTION-C

Marks: 27

NOTE: Attempt any three of the following questions. All questions carry equal marks.

2.
  - i. Explain Newton's laws of motion.
  - ii. A constant force  $F$  changes the speed of 80 kg sprinter from  $3\text{ms}^{-1}$  to  $4\text{ms}^{-1}$  in 0.5 s. Calculate the acceleration of the sprinter.
3.
  - i. What is conservative force? Show that gravitational force is conservative.
  - ii. A 70 kg athlete runs upstairs in 4 s. The vertical height of stairs is 4.5 m. Calculate his power.
4.
  - i. Explain any two applications of Bernoulli's equation.
  - ii. Calculate the speed of efflux of kerosene oil from a narrow hole of a tank, in which pressure is 4 atm. Density of kerosene oil is  $0.72\text{ kg m}^{-3}$ .  
(1 atm =  $1.03 \times 10^5$  pa)
5.
  - i. Define the molar heat capacities  $C_p$  and  $C_v$  for a gas. Show that for an ideal gas  $C_p - C_v = R$
  - ii. What is the change in internal energy of 200g of nitrogen as it is heated from  $10^\circ\text{C}$  to  $30^\circ\text{C}$  at constant volume? For  $\text{N}_2$ ,  $C_v = 20.815\text{ J mole}^{-1}\text{K}^{-1}$ .