

Write Serial No. of your answer book _____

Time Allowed : 20 Minutes

Maximum Marks : 17

Signature of Deputy Supdt. _____

Note : Use this paper to write the answers to the objective questions. No mark will be awarded for cutting, over-writing or using a pencil. This paper must be tagged with the answer-book.

1. Some possible answers to each statement are given below. Tick (✓) mark the correct answer :

(i) Significant figures in 0.000846 are : (Six , Four , Seven , Three)

(ii) If the line of action of force passes through axis of rotation or origin, then its torque is :

(Maximum. Unity. Zero. None of these.)

(iii) The magnitude of the vector $\frac{2}{3} \hat{i} - \frac{1}{3} \hat{j} + \frac{2}{3} \hat{k}$ is :

(Zero , One , Three , $\frac{1}{9}$)

(iv) Laws of motion are not valid in a system which is :

(Moving with uniform velocity. At rest. Isolated. Non inertial.)

(v) Horizontal range of projectile is related ^{with} maximum range according to relation :

($R = R_{\max} \sin 2\theta$, $R_{\max} = R \sin 2\theta$, $R_{\max} = \frac{R}{\sin 2\theta}$,
 $R = R_{\max} \sin 2\theta$ and $R_{\max} = \frac{R}{\sin 2\theta}$)

(vi) If the direction of force is perpendicular to the direction of motion of body, then work done is :

(Minimum. Maximum. Zero. Infinity.)

(vii) If a gymnast sitting on rotating stool with his arms outstretched lowers his arms :

(The angular speed decreases. The angular speed increases.
 The angular speed remains constant. None of these.)

(viii) A satellite moving round the earth constitute :

(Inertial frame of reference. Non-inertial frame of reference.
 Neither inertial nor non-inertial. Both inertial and non-inertial.)

(ix) If cross-sectional area of pipe decreases, the speed of fluid must increase according to :

(Venturi relation. Bernoulli's equation.
 Equation of continuity. Torricelli's theorem.)

(x) The frequency of a second's pendulum is : (One Hz , 0.5 Hz , 1.5 Hz , 2.0 Hz)

(xi) The cooking and heating of food by microwave oven is an example of :

(SHM. Resonance. Damped oscillations. None of these.)

(Turn Over)

(2)

1. (xii) It is possible to distinguish between transverse and longitudinal waves from the property of :

(Refraction. Interference. Diffraction. Polarization.)

(xiii) The speed of sound in air at 0°C is 330 mS^{-1} . Its speed at 2°C is :

(331.22 m S^{-1} , 33122 cm S^{-1} ,
 330 mS^{-1} , 331.22 m S^{-1} and 33122 cm S^{-1})

(xiv) When Newton's Rings are observed with reflected light, the central spot is :

(Red. Blue. Dark. Bright.)

(xv) An Astronomical Telescope is made with objective of focal length 100 cm and an eye piece of focal length 5 cm . The length of telescope when focused for infinity is :

(95 cm , 105 cm , 20 cm , None of these)

(xvi) At constant temperature, if volume of given gas is doubled, then density of the gas becomes :

(Double , $\frac{1}{4}$ of original , $\frac{1}{2}$ of original , Unchanged)

(xvii) The amount of heat required to melt one kg of ice at 0°C is called :

(Heat of vaporization. Heat capacity.

Latent heat of fusion of ice. None of these.)

to be

Note : All questions are attempted on the answer book.

SECTION – I

2. Write any TWENTY TWO short answers of the following questions :

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- (i) Differentiate between radian and steradian.
- (ii) Give the draw backs to use the period of a pendulum as a time standard.
- (iii) How many nano seconds are in 1 year ?
- (iv) What do you mean by unit vector?
- (v) Can a vector have a component greater than the vectors magnitude?
- (vi) Suppose the sides of a closed polygon represent vector arranged head to tail. What is the sum of these vectors?
- (vii) Find the range of the projectile.
- (viii) Under what conditions the velocity \vec{v} is not zero but acceleration \vec{a} is zero of a moving car.
- (ix) Define impulse and find its relation with momentum.
- (x) Prove the relation $P = \vec{F} \cdot \vec{V}$
- (xi) An object has 1 J of P.E. Explain what does it mean.
- (xii) A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?
- (xiii) Find the velocity of a disc rolls down along an inclined plane of height 10 m.
- (xiv) What is significance of moment of inertia?
- (xv) In what direction, the mud flies off a moving bicycle? Explain.
- (xvi) State the Stoke's Law and write its mathematical form.
- (xvii) Explain how the swing is produced in a fast moving cricket ball.
- (xviii) A person is standing near a fast moving train. Is there any danger that he will fall toward it?
- (xix) Can we realize an ideal simple pendulum?
- (xx) How resonance is produced in tuning a radio set?
- (xxi) Under what conditions does the addition of two S.H.M. produce a resultant, which is also simple harmonic?
- (xxii) Define node and antinode.
- (xxiii) Why sound travels faster in warm air than in cold air?
- (xxiv) How the beats are useful in tuning the musical instruments?
- (xxv) What is the physical difference between interference fringes and diffraction fringes?

(Turn Over)

(2)

2. (xxvi) Can visible light produce interference fringes? Explain.
- (xxvii) How would you distinguish between un-polarized and plane polarized light?
- (xxviii) Why would it be advantageous to use the blue light with a compound microscope?
- (xxix) Describe with the help of diagram, how biconvex lenses are arranged to form a microscope.
- (xxx) How the power is lost in optical fibre through dispersion? Explain.
- (xxxi) Differentiate between reversible and irreversible processes.
- (xxxii) Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- (xxxiii) Can the mechanical energy be converted completely into heat energy? Give example.

SECTION – II

Note : Attempt any THREE questions.

3. (a) State and explain law of conservation of momentum. 5
- (b) Two spherical balls of 2.0 kg and 3.0 kg masses are moving towards each other with velocities of 6.0 m s^{-1} and 4.0 m s^{-1} respectively. What must be the velocity of the smaller after collision, if the velocity of the bigger ball is 3.0 m s^{-1} ? 3
4. (a) How artificial gravity is provided in space satellites. Derive necessary relation for artificial gravity. 5
- (b) A 1000 kg car travelling with a speed of 144 km h^{-1} rounds a curve of radius 100 m. Find centripetal force required. 3
5. (a) Derive an expression for the K.E. and P.E. of the mass-spring system executing S.H.M. Also prove that its total energy remains conserved. 5
- (b) The displacement of a body executing S.H.M. is given by
- $$x = 0.25 \cos \left[\frac{\pi}{8} t \right]$$
- What is the displacement of the object after 2.0 second? 3
6. (a) Describe the construction and working of Michelson's interferometer. 5
- (b) In a double slit experiment, the second order maximum occurs at $\theta = 0.25^\circ$. The wave-length is 650 nm. Determine the slit separation. 3
7. (a) What is Carnot Engine? Calculate its efficiency. 5
- (b) A mechanical engineer develops an engine, working between 327°C and 27°C and claims to have an efficiency of 52%. Does he claim correctly? Explain. 3