RWP-21

Physics (Objective Type)

Time: 20 Minutes **Marks: 17**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Which one of the following is correct?

(A) $m=E/C^2$ (B) $m=C^2/E$ (C) $m=C^2E$ (D) $m=CE$

2. Which of the following is perpendicular to $4\hat{i}-3\hat{j}$:

(A) $4\hat{i}+3\hat{j}$ (B) $6\hat{i}$ (C) $7\hat{k}+\hat{i}$ (D) $3\hat{i}+4\hat{j}$

3. Torque is rotational analogous of:

(A) Momentum (B) Force (C) Weight (D) Axis of rotation

4. A ball is dropped from a height of 4.2 meters. To what height it will rise if there is no loss after rebounding?

(A) 4.2 m (B) 8.4 m (C) 12.6 m (D) 2.4 m

5. Total time for which the projectile remains in air is called:

(A) Time of projectile (B) Time period (C) Time of flight (D) Time constant

6. Dimensions of angular acceleration are:

(A) $[T^{-1}]$ (B) $[T^{-2}]$ (C) $[T^{-3}]$ (D) $[LT^{-2}]$

7. When a body moves in a circular path it's linear velocity:

(A) remains constant (B) becomes zero (C) changes (D) increases

8. If 20 waves pass through medium in one second with speed of 20 ms^{-1}, the wavelength is:

(A) 20 m (B) 2 m (C) 400 m (D) 1 m

9. Distance between two consective nodes is:

(A) λ (B) 2λ (C) $\frac{\lambda}{2}$ (D) $\frac{\lambda}{4}$

10. For mono atomic gas $C_v=\frac{3R}{2}$ therefore γ for this gas is:

(A) $3/5$ (B) $5/3$ (C) $4/15$ (D) $15/4$

11. Average velocity of molecules in gas is:

(A) zero (B) positive (C) negative (D) infinity

12. Gravity performs zero work when body moves:

(A) Vertically (B) Horizontally (C) at 60° with vertical (D) at 60° with horizontal

13. The SI unit of rate of flow of fluid is:

(A) m/s (B) m^3/s (C) m/s^2 (D) Kg m/s

14. Energy of particle executing SHM of amplitude X_o is proportional to:

(A) X_o^2 (B) X_o^{-2} (C) X_o (D) $X_o^2/2$

15. Formula for Fringe spacing is:

(A) $\frac{\lambda d}{L}$ (B) $\frac{\lambda L}{d}$ (C) $\frac{Ld}{\lambda}$ (D) $\frac{m\lambda L}{d}$

16. Length of astronomical telescope for normal adjustment is:

(A) f_o+f_e (B) f_o-f_e (C) $\frac{1}{f_o}-\frac{1}{f_e}$ (D) $\frac{1}{f_o}+\frac{1}{f_e}$

17. Least count of meter rod is:

(A) 0.01 cm (B) 0.001 cm (C) 0.1 cm (D) 1 cm

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

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Roll No._____ (To be filled in by the candidate)

(For all sessions)

RWP-21

Physics (Essay Type)

Time: 2:40 Hours **Section - I** **Marks: 68**

2- Write short answers of any eight parts from the following. **2 x 8 =16**

i. Write the dimensions of **(a)** Pressure **(b)** Density
ii. Define the terms **(a)** Unit vector **(b)** Position vector
iii. Calculate the maximum height of the projectile.
iv. Why fog droplets appear to be suspended in air?
v. What are the dimensions and units of coefficient of viscosity "η" in the formula $F = 6\pi\eta rv$.
vi. How the uncertainty in the average value of many measurements is assessed?
vii. Which of the given equation is correct? f=$v\lambda$ or $f = \frac{v}{\lambda}$.
viii. Show that the sum and difference of two perpendicular vectors of equal lengths are also perpendicular and of the same length.
ix. State and illustrate the "Right Hand Rule" of vector product.
x. Find the angle of projection of a projectile for which its maximum height and horizontal range are equal.
xi. At what point or points in its path does a projectile have its minimum speed, its maximum speed?
xii. Define isolated system.What is the importance of an isolated system in the conservation of linear momentum?

3- Write short answers of any eight parts from the following. **2 x 8 =16**

i. Prove that $P = \vec{F}.\vec{V}$.
ii. Derive the relation of work energy principle.
iii. Define Beats and Stationary waves.
iv. Prove that $v = r\omega$.
v. When a rocket re-enters the atmosphere, its nose cone becomes very hot.Where does this heat energy come from?
vi. Define angular momentum and write its different mathematical forms.
vii. When mud flies off the tyre of a moving bicycle in what direction does it fly?Explain.
viii. A block weighing 4.0 Kg extends a spring by 0.16m from its unstretched position.The block is removed and 0.50 Kg body is hung from the same spring.If the spring is now stretched and then released what is its period of vibration?
ix. Define simple pendulum and find the frequency of second pendulum.
x. Does the acceleration of a simple harmonic oscillator remain constant during its motion?Is the acceleration ever zero?Explain.
xi. What is the effect of pressure and density on speed of sound.
xii. Why does sound travel faster in warm air than in cold air?Explain.

4- Write short answers of any six parts from the following. **2 x 6 =12**

i. Write down the main parts of spectometer and two uses of spectometer.
ii. Specific heat of a gas at constant pressure is greater than specific heat at constant volume.Why?
iii. Derive Charle's Law from Kinetic theory of gases.
iv. Is it possible to construct heat engine that will not expel heat into the atmosphere?
v. How can we increase the internal energy?Explain.
vi. What do you mean by the term wavefront and ray of light?
vii. What is diffrating grating?Write its equation.
viii. In the Young experiment,one of the slits is covered with blue filter and other with red filter.What would be the pattern of light intensity on the screen?
ix. What do you understand by linear magnification and angular magnification?

Section - II 24

NOTE: Answer any three questions from the following.

5. **(a)** Define scalar product. Write down four characteristics of vector product. **05**
   (b) Find the angle of projection of a projectile for which its maximum height and horizontal range are equal. **03**
6. **(a)** What is gravitational field?Show that in gravitational field work done is independent of path followed. **05**
   (b) A church organ consists of pipes,each open at one end,of different lengths.The minimum length is 30mm and the longest is 4 m.Calculate the frequency range of the fundamental notes.(Speed of sound=340ms^{-1}). **03**
7. **(a)** Define and explain the centripetal force and derive the relation for it. **05**
   (b) What guage pressure is required in the city mains for a stream from a fire hose connected to the city mains to reach a vertical height of 15.0m? **03**
8. **(a)** Discuss energy conservation in SHM. **05**
   (b) Find the average speed of oxygen molecule in the air at STP. **03**
9. **(a)** Write down the construction and working of a Michelson's interferometer.Give its equation. **05**
   (b) A compound microscope has lenses of focal length 1.0 cm and 3.0cm.An object is placed 1.2cm from the object lens.If a virtual image is formed 25cm from the eye,calculate the magnification of the instrument. **03**