DISTRICT LEVEL FIRST PUC ANNUAL EXAMINATION FEBRUARY-2023

I PUC - PHYSICS (33)

Time: 3 hours 15 min. **Max Marks:** 70

Note: General Instructions:

1. All parts are compulsory.
2. Part – A questions have to be answered in the first two pages of the answer-booklet. For Part – A questions, first written-answer will be considered for awarding marks.
3. Answers without relevant diagram / figure / circuit wherever necessary will not carry any marks.
4. Direct answers to the numerical problems without detailed solutions will not carry any marks.

PART – A

I. Pick the correct option among the four given options for ALL of the following questions: **15 × 1 = 15**

1. The number of significant figures in 1.03×10^2 is:
   (A)2 (B) 3
   (C)5 (D) 6
2. What is the correct formula for relative velocity of a body A with respect to B?
   (A) Vector V_R = Vector V_A – Vector V_B
   (B)Vector V_R = Vector V_B + Vector V_C
   (C)Vector V_R = Vector V_A x Vector V_B
   (D)Vector V_R = Vector V_B – Vector V_A
3. Expression for centripetal acceleration of a particle moving with uniform speed v and in a circular path of radius r is
   (A) $a_c = v^2 r$ (B) $a_c = \omega^2 r^2$
   (C) $a_c = \frac{v}{r^2}$ (D) $a_c = \frac{v^2}{r}$
4. Which of these physical properties will be conserved during Newton's third law of motion?
   (A) Force exerted (B)Acceleration
   (C)Momentum (D)Angular momentum
5. 1 horse power(HP) is equal to:
   (A) 743Watt (B)746 Watt
   (C) 743Volt (D)746 Volt
6. If external force acting on the system is zero. Then the centre of mass of the system moves with constant_____
   (A) Acceleration (B) Force
   (C) Velocity (D)Torque
7. The period of geostationary artificial satellite is..
   (A) 12 hours (B) 6 hours
   (C) 48 hours (D)24 hours
8. Hooke's law states that _____
   (A) stress is always proportional to strain
   (B) stress is proportional to strain before ultimate tensile strength
   (C) stress is proportional to strain under elastic limit
   (D) stress and strain are never directly proportional
9. The unit of surface tension is same as that of _____
   (A) surface energy per unit volume
   (B) force per unit area
   (C) surface energy per unit area
   (D) surface energy per unit length

10. The change from solid state to vapour state without passing through the liquid state is called as _____

(A) Vaporisation
(B) Melting
(C) Boiling
(D) Sublimation

11. Sea breeze is:

(A)the convective movement of air from sea towards land during daytime
(B) the convective movement of air from land towards sea during daytime
(C)the convective movement of air from sea towards land during night
(D)the convective movement of air from land towards sea during night

12. Internal energy of a system is defined as?
(A) The sum of kinetic energies of all molecules of the system
(B) The sum of kinetic and potential energies of all molecules of the system
(C) The sum of potential energies of the system
(D) The average kinetic energy of all molecules

13. How many degrees of freedom are there in a diatomic gas?
(A) 2
(B) 5
(C) 3
(D) 1

14. When a system oscillates with its natural frequency then it is called as

(A) Free oscillations
(B) Forced oscillations
(C) Driven oscillations
(D) None

15. A source of sound moves towards an observer. What happens to the speed of sound in the medium?
(A) Increases
(B) Decreases
(C) Remains the same
(D) Depends on speed with which source moves

II. Fill in the blanks by choosing appropriate answer given in the brackets for ALL the following questions: **5 × 1 = 5**

(constant, maximum ,absent, zero ,sum,)

16.A body is said to be in equilibrium if the net force acting on it is_____

17.The state in which the reaction of a body is_____ is called weightlessness

18.For a tube of flow the product of area of cross-section and a speed of liquid is _____at all points

19.The total pressure of a mixture of ideal gas is the_____ of the partial pressure.

20.A particle performing S.H.M. passing through mean position has_____ kinetic energy

PART – B

III. Answer any FIVE of the following questions: **5 × 2 = 10**

21. Name any two basic forces in nature.

22.Draw the position-time graph for (i) a body at rest (ii) a body moving with decreasing velocity.

23.When will be the cross product of two vector is (i) maximum (ii) minimum.

24.What is elastic collision? Give one example.

25.Write the relation connecting moment of inertia and radius of gyration and explain the terms.

26. State and explain Newton's law of gravitation.

27. Give any two applications of pascal's law.

28. Mention any two postulates of kinetic theory of gases.

29. Distinguish between longitudinal and transverse waves.

PART – C

IV. Answer any FIVE of the following questions: **5 × 3 = 15**

30. Check the consistency (correctness) of the equation $\frac{1}{2}$ $mv^2 = mgh$ using dimensional analysis (symbols have usual meanings).

31. Derive an expression for the magnitude of resultant of two vectors acting at a point by making an angle θ between them.

32. State Newton's second law and hence derive F=ma

33. A man pushes a roller with a force of 50N through a distance of 20m. Calculate the work done if the handle of the roller is inclined at an angle 60^0 with the ground.

34. Show that rate of change of angular momentum of a particle is equal to torque acting on it.

35. Explain stress-strain curve.

36. Derive the expression for liquid pressure at a point inside the liquid.

37. Mention any three properties of thermal radiation.

38. Discuss the mode of vibration in stretched string.

PART – D

V. Answer any THREE of the following questions: **3 × 5 = 15**

39. What is velocity – time graph? Derive $V^2 = V_0^2 + 2aX$ using velocity – time graph.

40. Derive an expression for maximum safe speed of a car on a banked road in circular motion.

41. State and prove law of conservation of energy in case of a freely falling body.

42. (i) Define orbital speed. (1)

(ii) Derive an expression for orbital speed of earth's satellite. (3)

(iii) Write the relation between escape speed and orbital speed. (1)

43. Derive an expression for efficiency of Carnot's heat engine with the help of P-V diagram.

44. (i) What is periodic motion. (1)

(ii) Mention the expression for angular frequency in the case of SHM of a particle. (1)

(ii) Derive an expression for the total energy of a particle executing SHM. (3)

VI. **Answer any TWO of the following questions:** **$2 \times 5 = 10$**

15. An object is projected with a velocity of 60 ms^{-1} in a direction making an angle of 60^0 with the horizontal. Find

(a) the maximum height.

(b) the time taken to reach maximum height.

(c) the horizontal range.

46. A wheel is rotating at a rate of 1200 rpm and its kinetic energy is 10^6 J. Determine the moment of inertia of the wheel about its axis of rotation.

47. When 0.15kg of ice of 0 ^{0}C mixed with 0.30 kg of water at 50 ^{0}C in a container, the resulting temperature is 6.7^{0}C . Calculate the heat of fusion of ice.
(Given specific heat capacity of water S_w=4186 J $kg^{-1}K^{-1}$)

48. A train moving at a speed of 72kmph towards a station is sounding a whistle of frequency 600Hz. What are the apparent frequencies of the whistle as heard by a man on the platform when the train

(a) approaches him

(b) recedes from him

(Given speed of sound in still air is 340ms^{-1})