Part - III
PHYSICS, Paper - I
(English Version)

Time : 3 Hours

Max. Marks : 60

SECTION - A

10 × 2 = 20

Note : i) Answer **ANY TEN** of the following questions.

ii) Each question carries **TWO** marks.

iii) All are very short answer type questions.

1. What are the fundamental forces in nature?

2. Distinguish between fundamental units and derived units.

3. Why do we have different units for the same physical quantity?

4. If $P = 2i + 4j + 14k$ and $Q = 4i + 4j + 10k$, then find the magnitude of $P + Q$.

5. We cannot open or close the door by applying force at the hinges. Why?

6. Is it necessary, that a mass should be present at the center of mass of any system?

7. When does a real gas behave like an ideal gas?

8. Give an expression for the excess pressure of the soap bubble in air.

9. Two forces of magnitudes 3 units and 5 units act at 60^0 with each other. What is the magnitude of their resultant?

10. If a bomb at rest explodes into two pieces, the pieces must travel in opposite directions. Explain.

11. What happens to the coefficient of friction if the weight of the body is doubled?

12. Express unified atomic mass unit in kg.

13. By spinning eggs on a table top, how will you distinguish a hard boiled egg from a raw egg?

14. What is magnus effect?

15. State Dalton's law of partial pressures.

SECTION - B $6 \times 4 = 24$

Note : i) Answer **ANY SIX** of the following questions.

   ii) Each question carries **FOUR** marks.

   iii) All are of short answer type questions.

16. Explain the advantages and disadvantages of friction.

17. Show that the trajectory of an object thrown at a certain angle with the horizontal is a parabola.

18. What is escape velocity? Obtain an expression for it.

19. Explain Celsius and Fahrenheit scales of temperature. Obtain the relation between Celsius and Fahrenheit scales of temperature.

20. Using parallelogram law of vectors, derive an expression for the magnitude and direction of the resultant vector.

21. A bird holds a fruit in its beak and flies parallel to the ground. It lets go of the fruit at some height. Describe the trajectory of the fruit as it falls to the ground as seen by (a) the bird (b) a person on the ground.

22. If $\left| \vec{a} + \vec{b} \right| = \left| \vec{a} - \vec{b} \right|$ prove that the angle between $\vec{a}$ and $\vec{b}$ is 90^0.

VT-57 (Day-9)   2

23. Can the velocity of an object be in a direction other than the direction of acceleration of the object? If so, give an example.

24. State the laws of rolling friction.

25. Define angular velocity (ω). Derive $V = r\omega$.

26. What is the geostationary satellite? State its uses.

27. State and explain first law of thermodynamics.

28. Describe the behaviour of a wire under gradually increasing load.

29. Compare isothermal and an adiabatic process.

SECTION - C $2 \times 8 = 16$

Note : i) Answer **ANY TWO** of the following questions.

     ii) Each question carries **EIGHT** marks.

     iii) All are of long answer type questions.

30. Develop the notions of work and kinetic energy. Show that it leads to work-energy theorem.

    A pump is required to lift 600 kg of water per minute from a well 25 m deep and to eject it with a speed of 50 ms^{-1}. Calculate the power required to perform the above task.

31. Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. What is seconds pendulum?

32. State and explain Newton's law of cooling. State the conditions under which Newton's law of cooling is applicable. A body cools down from 60^{0}C to 50^{0}C in 5 minutes and to 40^{0}C in another 8 minutes. Find the temperature of the surroundings.

33. What are collisions? Explain the possible types of collisions. Develop the theory of one dimensional elastic collision.