FULL PORTION EXAMINATION-PHYSICS

Instructions:

The question paper comprises of four parts

You are to attempt all the parts. An internal choice of questions is provided wherever: applicable

All questions of Part I, II, III, and IV are to be attempted separately

Question numbers 1 to 15 in Part I are Multiple choice Questions of one mark each. These are to be answered by choosing the most suitable answer from the given four alternatives and writing the option code and the corresponding answer

Question numbers 16 to 24 in Part II are two-mark questions.24 is compulsory

Question numbers 25 to 33 in Part III are three-mark questions.33 is compulsory

Question numbers 34 to 38 in Part IV are five-mark questions. These are to be answered in detail. Draw diagrams wherever necessary.

Time:3 hrs   **Max Marks:70**

TURN THE PAPER AND START ANSWERING THE QUESTION

PART-I

(i)Choose the most suitable answer [15 X 1=15]

(ii)Answer all the question with corresponding option code.

1.If an object is dropped from the top of a building and it reaches the ground at t = 4 s, then the height of the building is (ignoring air resistance) (g = 9.8 m s-2).
(a) 77.3 m   (b) 78.4 m   (c) 80.5 m   (d) 79.2 m

2.A spring of force constant k is cut into two pieces such that one piece is double the length of the other. Then, the long piece will have a force constant of

(a) $\dfrac{2}{3}k$ (b) $\dfrac{3}{2}k$ (c) $3k$ (d) $6k$

3.An ideal gas passes from one equilibrium state (P1, V1, T1, N) to another equilibrium state (2P1, 3V1, T2, N). Then ....

(a) $T_1 = T_2$ (b) $T_1 = \dfrac{T_2}{6}$ (c) $T_1 = 6T_2$ (d) $T_1 = 3T_2$

4.The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are KA, KB and KC respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then .....

(a) KA > KB > KC   (b) KB < KA < KC   (c) KA < KB < KC   (d) KB > KA > KC

5.A length-scale (l) depends on the permittivity (ε) of a dielectric material, Boltzmann constant (kB), the absolute temperature (T), the number per unit volume (n) of certain charged particles, and the charge (q) carried by each of the particles. Which of the following expression for l is dimensionally correct?.

(a) $l = \sqrt{\dfrac{nq^2}{\varepsilon k_B T}}$ (b) $l = \sqrt{\dfrac{\varepsilon k_B T}{nq^2}}$ (c) $l = \sqrt{\dfrac{q^2}{\varepsilon n^3 k_B T}}$ (d) $l = \sqrt{\dfrac{q^2}{\varepsilon n k_B T}}$

6.Streamlined flow is more likely for liquids with ....
(a) high density and low viscosity
(b) low density and high viscosity
(c) high density and high viscosity
(d) low density and low viscosity

7.A book is at rest on the table which exerts a normal force on the book. If this force is considered as reaction force, what is the action force according to Newton's third law?
(a) Gravitational force exerted by Earth on the book
(b) Gravitational force exerted by the book on Earth
(c) Normal force exerted by the book on the table
(d) None of the above

8.If the internal energy of an ideal gas U and volume V are doubled then the pressure ……
(a) doubles   (b) remains same   (c) halves   (d) quadruples

9.A round object of mass m and radius r rolls down without slipping along an inclined plane. The fractional force,
(a) dissipates kinetic energy as heat.
(b) decreases the rotational motion.
(c) decreases the rotational and transnational motion ,
(d) converts transnational energy into rotational energy

10.A simple pendulum is suspended from the roof of a school bus which moves in a horizontal direction with an acceleration a, then the time period is …..

(a) $T \propto \dfrac{1}{g^2 + a^2}$

(b) $T \propto \dfrac{1}{\sqrt{g^2 + a^2}}$

(c) $T \propto \sqrt{g^2 + a^2}$

(d) $T \propto (g^2 + a^2)$

**11.A man sitting on a swing which is moving to an angle of 60° from the vertical is blowing a whistle which has a frequency of 2.0 k Hz. The whistle is 2.0 m from the fixed support point of the swing. A sound detector which detects the whistle sound is kept in front of the swing. The maximum frequency the sound detector detected is …….**
(a) 2.027 kHz   (b) 1.947 kHz   (c) 9.74 kHz   (d) 1.011 kHz

12.When object begins to slide, the static friction acting on the object attains _____ value.
(a) zero   (b) minimum   (c) maximum   (d) infinity

13.Two light balls are suspended as shown in the figure. When a stream of air passes through the space between them, the distance between the balls will ……..
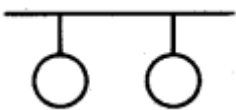
(a) increase   (b) decrease   (c) remain the same   (d)bursts due to high pressure.

14.A person standing between two parallel hills fires a gun and hears the first echo after t1 sec and the second echo after t2 sec. The distance between the two hills is …..

(a) $\dfrac{v(t_1 - t_2)}{2}$ (b) $\dfrac{v(t_1 t_2)}{2(t_1 + t_2)}$ (c) $v(t_1 + t_2)$ (d) $\dfrac{v(t_1 + t_2)}{2}$

15.If p is the momentum of the particle then its kinetic energy is

(a) $\sqrt{2Mp}$ (b) $\dfrac{p}{2M}$ (c) $\dfrac{p^2}{2m}$ (d) $\dfrac{2m}{p}$

PART-II

(i)Answer any SIX of the following   [6 X 2=12]

(ii)Qn number 24 is compulsory

16.How do you deduce that two vectors are perpendicular?

17.Write the differences between conservative and non-conservative forces.

18.State principle of moments.

19.State the number of significant figures in the following i)600800 ii)5213.0

20.Define Gravitational field intensity.

21.Define the Poisson's ratio.

22.500 g of water is heated from 30 degree celsius to 60 degree celsius.Ignoring the slight expansion of water calculate the change in internal energy of the water?(Specific heat of water is 4184 J/Kg.K)

23.What is an epoch?

24.Consider an object of mass 50kg at rest on the floor.A Force of 5N is applied on the object but it does not move.What is the frictional force acts on the object?

PART-III

i)Answer any SIX of the following.

ii)Question number 33 is compulsory.

25.Obtain an equation of continuity for a flow of fluid on the basis of conservation of mass.

26.Derive the expression for Efficiency of Carnot engine.

27.Write down any six postulates of kinetic theory of gases.

28.Show that a path followed by a projectile is an parabola incase of horizontal projection.

29.Discuss rolling on inclined plane and arrive at an expression for acceleration.

30.State and explain work-kinetic energy theorem.

31.Describe the methods to measure the angle of repose.

32.Explain the variation of accelration due to gravity "g" with latitude.

33.Consider a tunning fork which is used to produce resonance in air column.At room temperature two successive resonances observed are at 20cm and 85cm of the column height.If the frequency of the length is 256 Hz.Compute the velocity of the sound in air at room temperature.

PART-IV

Note:Answer all the questions.

34.i)Write down the limitations of the method of dimensional analysis.

   ii)Check the dimensional correctness of the equation v=u+at.

OR

   Discuss in detail the energy in the simple hormonic motion with a graph.

35.Explain the motion of blocks connected by a string in a vertical motion.

OR

Derive the expression for terminal velocity of a sphere moving in a high viscous fluid using stokes force.

36.Describe Newtons formula for velocity of sound waves in air and also discuss the Laplace correction.

OR

State and Prove perpendicular axis theorem.

37.Explain the Triangle law of addition in detail.

OR

Derive Meyers releation Cp-Cv=R for an ideal gas.

38.Explain in detail the Eratosthenes method of finding the radius of Earth.

OR

Derive the expression for mean free path of a gas and list the factors affecting it.