Anjuman Islam Janjira Degree College of Science Murud-Janjira, Raigad-402401 Affiliated to University of Mumbai	
Class: -F.Y.B.Sc.	**Subject: - Physics - I**
Semester:- I	**Course code: -USPH101**
Exam Event:- Additional Exam Summer 2024 (FH)	**Marks: -75**
Date:- 27/03/2024	**Duration:- 2.30 Hours**

Q1. Attempt any Four of the following. (20)

1) State and Explain Newton's laws of motion. A bullet moving at 250 m/s penetrate 5 cm into a tree limb before coming to rest. Assuming that the force exerted by the tree limb is uniform, find it's magnitude (mass of bullet is 10g)

2) A cricket ball of mass 0.35 kg moving with velocity 10 m/s and hit by a bat so that the ball turn back with a velocity 20 m/s the force on the ball act for 0.35 s then find the average force exerted on the ball.

3) Explain the concept of coefficient of friction and laws of friction.

4) Explain the laws of friction. A Block of mass 2kg is kept on horizontal surface when a horizontal force of 15 N is applied to it the block doesn't slide calculate the coefficient of static friction.

5) Explain work and energy theorem.

6) Define power, an elevator weighting 500 kg is to be lifted up at a constant velocity of 0.2 m/s what would be the minimum horsepower of the motor to be used?

Q 2. Attempt any Four of the following. (20)

1) State and explain Hooks Law Along with three modulus of elasticity.

2) A Load of 4 kg is suspended from ceiling through a steal wire of length 20 m & radius 2mm. it is found that the length of wire increases by 0.031 mm as equilibrium is achieved. Find Young's modulus of steel. Take $g = 3.1\pi$ m/s^2.

3) State and explain law of viscosity and coefficient of viscosity.

4) Find the terminal velocity of rain drop of radius 0.01 mm. coefficient of viscosity of air is 1.8×10^{-5} Ns/m^2 and its density is 1.2 kg/m^3, density of water is 1000 kg. take $g = 10$ m/s^2.

5) Derive the relation of equation of continuity.

6) liquid of density 1200 kgm^{-3} Flowing steadily in a tube varying cross section. The cross section at point A is 1 cm^2 & that at B is 20 mm^2, the point A and B are in the same horizontal plane the speed of liquid at A is 10 cm/s. calculate the difference in pressure at A & B.

Q 3. Attempt any Four of the following. (20)

1) Describe the first law of thermodynamics in brief.

2) What is Vander Waals equation of state. Explain the Correction for Volume in Vander Waals equation of state in brief.

3) What is isothermal process? Calculate the change in internal energy of system when 1000J of heat is provided to the system and 300 J of work done by the system.

4) What is mean by thermodynamics system? Explain its types.

5) Describe the concept of heat engine and its efficiency.

6) A Carnot's heat engine absorbs 500K of heat from source and reject 100K to sink calculate

i) Work done by heat engine

ii) Efficiency.

Q4. A) Select correct answer. (Solve any 8 out of 12) (08)

1) Inertial frames of reference are frames that are:

a) Accelerating b) At rest c) Moving with constant velocity d) Non-inertial

2) Which of the following is an application of Newton's third law of motion?

a) Walking b) Rocket propulsion c) Magnetic attraction d) Water flowing downhill

3) The coefficient of friction is a measure of:

a) The force of friction between two objects b) The area of contact between two objects

c) The speed of the objects d) The mass of the objects

4) Non-conservative forces are forces that:

a) Do no work b) Do work that is path-dependent

c) Do work that is independent of the path taken d) Do work only on stationary objects

5) If a material returns to its original shape and size after deformation, it is said to be:

a) Elastic b) Plastic c) Rigid d) Brittle

6) A material has a shear modulus of 2×10^9 N/m^2. If a shear stress of 1×10^6 N/m^2 is applied, what is the shear strain in the material?

a) 0.5×10^{-3} b) 0.2×10^{-3} c) 0.5×10^{-9} d) 0.2×10^{-9}

7) Poiseuille's equation is used to describe the flow of a fluid through:

a) A wide tube b) A narrow tube c) A pipe d) A porous material

8) Bernoulli's equation is a consequence of the principle of conservation of:

a) Mass b) Energy c) Momentum d) Temperature

9) The Van der Waals equation accounts for:

a) Molecular size and intermolecular forces b) Only molecular size

c) Only intermolecular forces d) Temperature and pressure

10) Heat is best described as:

a) A form of energy b) A form of matter

c) The total internal energy of an object d) The ability of an object to do work

11) During an isothermal process, the internal energy of a gas:

a) Increases b) Decreases c) Remains constant d) Cannot be determined

12) In a Carnot engine, if the high-temperature reservoir is at 600 K and the low-temperature reservoir is at 300 K, what is the efficiency of the engine?

a) 40% b) 50% c) 60% d) 70%

Q4. B) Answer in one sentence (Solve any three out of five) (03)

1) What is inertial frame of reference?

2) State Work Energy theorem.

3) Define Elasticity along with examples.

4) What is critical velocity?

5) State Zeroth law of Thermodynamics.

Q4. C) Fill in the Blanks (Solve any four out of six) (04)

1) Inertial frames of reference are frames in which an object with zero net force acting on it will have a constant _____.

2) Friction at the atomic level is a result of _____ forces between the atoms of the materials in contact.

3) Poiseuille's equation describes the flow of a fluid through a _____.

4) Critical velocity is the minimum velocity at which a fluid can flow smoothly, and above this velocity, the flow becomes _____.

5) The Van der Waals equation predicts that at low temperatures and high pressures, real gases will occupy _____ volume than predicted by the ideal gas law.

6) The internal energy of a system is the total _____ energy of its molecules and atoms.