



SHRI S.H. KELKAR COLLEGE OF ARTS, COMMERCE & SCIENCE, DEVGAD

FIRST TERM END EXAMINATION 2023

USPH 101

MAX.MARKS:75

DURATION: 2 1/2 HOURS

- N.B (i) All questions are compulsory.
(ii) Figures to the right indicate full marks.
(iii) Use of non-programmable calculator is allowed.

- Q 1.A) Attempt any One. 08
(i) What is kinetic friction? The coefficient of friction between a block of mass M and incline angle ' θ ' of the incline with the horizontal so that body does not slip on the plane. If the incline makes $\theta/2$ with the horizontal, find frictional force on the block.
(ii) Two unequal masses m_1 and m_2 connected by light and an inextensible string of negligible mass are hung over light and frictionless pulley (system is known as Atwood's machine). Determine the Acceleration due to gravity and tension T produced in the string.
- Q 1.B) Attempt any One. 08
(i) State Newton's laws of motion with suitable examples.
(ii) State and prove the work-energy theorem.
- Q 1.C) Attempt any One. 04
(i) Write short notes on mass- energy equivalence.
(ii) A spring is held constant with upper end fixed to a support. It was stretched by 3 cm when a mass of 205 gm was attached to its lower end. Determine the force constant of the spring.
- Q 2.A) Attempt any One. 08
(i) Derive and expression for the Bernoulli's equation.
(ii) Show that for homogeneous isotropic material $Y = 2\eta(1 + \dots)$
- Q 2.B) Attempt any One. 08
(i) Define (i) Coefficient of viscosity (ii) poise (iii) terminal velocity (iv) viscous force and (v) critical velocity
(ii) Derive equation of continuity.
- Q 2.C) Attempt any One. 04
(i) Explain the terms (i) Streamline flow and (ii) turbulent flow

(ii) Define stress and strain and hence explain the Young's modulus of elasticity's

Q 3.A) Attempt any One. 08

(i) Show that $C_p - C_v = R$ for a perfect gas.

(ii) Derive Van der Waals equation of state.

Q 3.B) Attempt any One. 08

(i) Derive an expression for the work done by a perfect gas in an adiabatic process.

(ii) State and explain zeroth law of thermodynamics

Q 3.C) Attempt any One. 04

(i) An ideal gas isothermally expands at 27°C so that its initial volume is doubled [$R = 8.3 \text{ J/deg.Mole}$]

(ii) What are limitations of Van der Waals equation?

Q.4) Attempt any Three 15

(i) A gas enclosed in a cylinder expands to double of its initial volume at a constant pressure of 1 atmosphere. How much work is done in this process.

(ii) Explain Inertial and non-inertial frames of reference

(iii) Advantages & disadvantages of friction in daily life

(iv) Explain Kinetic Energy and potential energy.

(v) Distinguish between real and ideal gases.

(vi) Write note on streamline and turbulent flow.