

Day : Monday
Date : 30/10/2017

W-2017-0542

Time : 11.00 A.M. TO 02.00 PM
Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate full marks.
- 3) Use of electronic calculator/ log table is allowed

Q.1 A) Attempt all the followings: (06)

- a) Which of the following forces is responsible for holding the nucleus of an atom together?
 - i) Electromagnetic force
 - ii) Gravitational force
 - iii) Strong interaction force
 - iv) Weak interaction force
- b) What force required for producing 5 m/s^2 acceleration in of body of mass 1500 kg?
 - i) 7500 N
 - ii) 300 N
 - iii) 750 N
 - iv) 0.75 N
- c) The following rain drops are spherical in shape because of
 - i) viscosity
 - ii) surface tension
 - iii) atmospheric pressure
 - iv) none of these
- d) Find the work done in blowing a soap bubble of area $A=6.28 \times 10^{-2} \text{ m}^2$. Surface tension of soap bubble is $T=0.025 \text{ N/m}^2$
 - i) $1.57 \times 10^{-3} \text{ J}$
 - ii) $15.7 \times 10^{-3} \text{ J}$
 - iii) $0.157 \times 10^{-3} \text{ J}$
 - iv) $251.2 \times 10^{-2} \text{ J}$
- e) is the more viscous fluid than others.
 - i) Water
 - ii) Glycerin
 - iii) Kerosene
 - iv) Petrol
- f) Viscosity is a in fluid.
 - i) Internal friction
 - ii) External friction
 - iii) Both internal & external friction
 - iv) All of these

B) Attempt all of the followings (06)

- a) Define surface tension, hence obtain its dimensions.
- b) State any two factors affecting which affect the surface tension.
- c) State Bernoulli's theorem.
- d) A steel wire of length 200 cm elongated through 0.23 cm by the application of force at its free end. Calculate strain produced in the wire.
- e) Write statement and relation between mass-energy equivalence.
- f) State Kepler's first and second law of planetary motion.

Q.2 Attempt any **THREE** the followings: (12)

- a) What is the gravitational force? Write its properties.
- b) Find the work done in moving a particle along a vector $r=3i-j+6k$ meter, if applied force is $F=i+3j+2k$
- c) How will you compare the moments of inertia of two bodies using a Torsional pendulum? Derive the necessary formula.
- d) Show that the speed of liquid coming out through a hole at the depth h below the free surface of liquid is same as that of freely falling body through the height h .

Q.3 Attempt any **FOUR** the followings: (12)

- a) What is the electromagnetic force? Write any two properties of electromagnetic force.
- b) Calculate the work done during the displacement of block through distance S by the constant force.
- c) Young's modulus for steel is $20 \times 10^{10} \text{ N/m}^2$ and its rigidity modulus is $8 \times 10^{10} \text{ N/m}^2$. Calculate Poisson's ratio.
- d) Write note on streamline flow of a fluid.
- e) State any three applications of surface tension in our everyday life.

P.T.O.

Q.4. Attempt any **TWO** the followings **(12)**

- a) Prove the relation between Young's modulus (Y), Bulk modulus (k) and Poisson's ratio (σ) as $Y = 3k(1 - 2\sigma)$, where symbols have their usual meanings.
- b) The diameter of the throat of a venturimeter is 4cm. When it is inserted into pipeline of diameter 10cm, the pressure difference between the pipe and the throat maintained equal to 9cm of water. Calculate the rate of flow.
- c) Obtain Jeager's formula used to determine surface tension of a liquid.

Q.5 Attempt any **TWO** the followings: **(12)**

- a) What is the fictitious force? Explain with examples.
- b) Show that the kinetic energy of the particle in translation motion is $\frac{1}{2}mv^2$, while in rotational motion is $\frac{1}{2}I\omega^2$,
- c) Define Poisson's ratio. Show that Poisson's ratio cannot be higher than 0.5 for incompressible body.

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