# EASTERN UNIVERSITY, SRI LANKA

## FIRST EXAMINATION IN SCIENCE – 2015/2016

## FIRST SEMESTER (JULY/AUGUST 2017)

## PH 105 GENERAL PHYSICS

me: 01 hour

nswer ALL Questions

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01.

(a) Define three elastic moduli: *Young's modulus*, *rigidity modulus*, and *bulk modulus* of ductile material.

Derive an expression for Young's modulus of an elastic material by identifying necessary parameters.

A uniform rod made of a certain material has a length of 50 cm and diameter of cross-section 0.4 cm. When the rod is subjected to a tensile force of $6\times10^3$ N along its length, the length increases by 0.2 cm and its diameter decreases by $3\times10^{-4}$ cm. Determine (a) Young's modulus (b) Poission's ratio and (c) bulk modulus of the material.

Given that the relationship between the Young's modulus $Y$ and Poission's ratio $\sigma$ expressed as

$$Y = 3k(1 - 2\sigma),$$

where $k$ is the bulk modulus of the material.

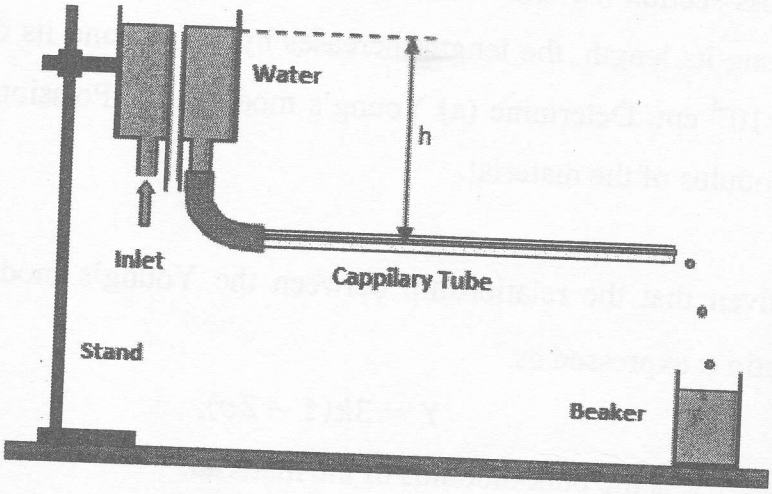
02. Explain what is meant by the term *streamline* in describing fluid flow.

Show that for a laminar flow, the volume of fluid $V$ discharged in time $t$ th horizontal pipe of radius $a$ and length $l$, subject to a pressure difference $p$ i by the Poisuille's equation:

$$\frac{V}{t} = \frac{\pi p a^4}{8\eta l},$$

where $\eta$ is the viscosity of the fluid. State clearly the assumptions made ne to derive the Poisuille's equation.

The above figure shows a constant pressure apparatus consists of a ho capillary tube of inner radius 0.7 mm and length 22 cm. The water col height $h$ =30 cm maintains a streamline flow through the capillary tube.




Determine the volume of water collected in the beaker through the free en the capillary tube in 60 seconds.

Given that

the density of water is 1000kgm$^{-3}$

the coefficient of viscosity of water is $1\times10^{-3}$ kgs$^{-1}$m$^{-1}$, and

the gravitational acceleration is 10 ms$^{-2}$.