

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [2016-19]

B.A./B.Sc. FIRST SEMESTER (July – December) 2016

Mid-Semester Examination, September 2016

Date : 17/09/2016

PHYSICS (General)

Time : 12 noon – 1 pm

Paper : I

Full Marks : 25

(Answer five questions taking atleast one from each group)

Group – A

1. a) Define elastic limit. Show that the Poisson's ratio lies between -1 and $\frac{1}{2}$. [3]
b) A wire 1 metre long and 2 mm^2 in cross-section is stretched by a load of 1 kg. Calculate the energy stored in the wire. Y for the material of the wire = 10^{11} N/m^2 . [2]
2. a) A uniform beam is clamped at one end and loaded at the other. Obtain the relation between load and depression at the loaded end when the weight of the beam is neglected. [3]
b) Two cylinders have the same length and mass and are made of the same material. One of them is solid while the other is hollow having an external radius thrice its internal radius. Compare their torsional rigidities. [2]
3. a) State and prove the equation of continuity of flow of fluid. [3]
b) A pipe is running full of water. At certain point A it tapers from 0.6 m diameter to 0.2 m diameter at B. The pressure difference between A and B is 1m of water column. Find the rate of flow water through pipe. [2]

Group – B

4. a) What is optical path length? Describe Fermat's principle in optics. [3]
b) Establish the laws of reflection on a plane mirror using Fermat's principle. [2]
5. Establish the Laws of refraction at a spherical surface using Fermat's principle. [5]
6. Derive the formula of equivalent focal length of two thin lenses separated by a distance d . [5]

Group – C

7. Set up the differential equation of motion of a simple harmonic oscillator subject to a damping force and an external simple harmonic force and find the transient solution of the differential equation for $b < \omega_0$. [Given, b is damping factor and ω_0 is the natural frequency of the oscillator] [2+3]
8. What do you mean by Lissajous figure? Deduce an expression for Lissajous figure of two simple harmonic motions acting at right angle of same frequency. [2+3]

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