Total No. of Questions : 8] *[Total No. of Printed Pages : 2*

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AU/IP/IEM/ME/AE/PR-303

B.E. III Semester

Examination, December 2016

Strength And Mechanics of Materials

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions out of eight.

ii) All questions carry equal marks.

1. a) Describe various mechanical properties of materials.

   b) Explain the terms Strain, Shear strain, Young's modulus and Modulus of rigidity.

2. Determine the total compression of a bar made up of three circular cross sections as shown in figure 1 and the diameters being 10 mm, 20 mm and 30 mm respectively.

   Take $E_s = 210$ GPa, $E_b = 105$ GPa and $E_c = 100$ GPa.

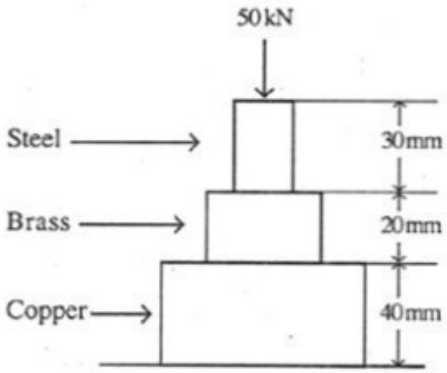

Figure 1

3. What do you mean by principal planes and principal stresses. The stresses on two perpendicular planes through a point in a body are 30 MPa and 15 MPa both tensiles along with a shear stress of 25 MPa. Find

   i) The magnitude and direction of principal stresses

   ii) The planes of maximum shear stress

4. a) Derive the relation.

   $$\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$$ for simple bending.

   b) A 280 mm × 120 mm × 10 mm I beam in to be used as a cantilever of 3.6 m length. Find the uniformly distributed load which can be carried safety if the permissible stress is 125 MPa.

5. An 80 mm wide and 180 mm deep cantilever in of 3m span. It carries a uniformly load of 6 kN/m intensity on a 2m length starting from the free end. Determine the slope and the deflection at the free end. E = 205 GPa.

6. a) What are the assumption made in the theory of torsion.

   b) Develop an expression for strain energy in a shaft subjected to torsion.

7. A shaft transmits 280 kW of power at 160 rpm. Determine

   i) The diameter of solid shaft to transmit the power

   ii) The inner and outer diameters of a hollow shaft if the ratio of inner to the outer diameter in 2/3.

8. a) What do you mean by theories of failure? What is their importance?

   b) What is meant by equivalent length of columns? What are it's values for different end conditions of column?

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