Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: STRENGTH OF MATERIALS [CIE 3283] Open Elective-1

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. Draw the SFD and BMD for the beam loaded as shown in the **figure 1A**. Mark the salient points and their values on the diagram. **4**

1B. List any six assumptions made in pure bending theory. **3**

1C. A simply supported wooden beam of span 1.3 m having a cross-section 150 mm wide by 250 mm deep carries a point load W at the centre. The permissible stress in bending is 7 N/mm^2 and 1 N/mm^2 in shearing. Calculate the safe load W. **3**

2A. A timber beam of rectangular section of length 8 m is simply supported. The beam carries a U.D.L. of 12 kN/m run over the entire length and a point load of 10 kN at 3 m from the left support. If the depth is two times the width and the stress in the timber is not to exceed 8 N/mm^2, find the suitable dimensions of the section. **5**

2B. An I – section beam 350 mm x 200 mm has a web thickness of 12.5 mm and a flange thickness of 25 mm as shown in **figure 2B**. It carries a shearing force of 200 kN at a section. Sketch the shear stress distribution. **5**

3A. A solid steel shaft of 60 mm diameter is to be replaced by a hollow steel shaft of the same material with internal diameter equal to half of the external diameter. Find the diameters of the hollow shaft and saving in material, if the maximum allowable shear stress is same for both shafts. **5**

3B. A beam AB of span 6 m is simply supported at the ends and is loaded with a point load of 6 kN at 2m from the left support and a uniformly distributed load of 2 kN/m from the second half of the beam as shown in **figure 3B**. Find the deflection at mid span and slope at the left support. Assume E = 20 GPa and I = 200 x 10^{-6} m^4. **5**

Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

4A. A point in a strained material is subjected to the stresses as shown in **figure 4A**. Locate the principal planes, evaluate the principal stresses and maximum shear stress. **4**

4B. With a neat diagram derive torsion formula. **5**

4C. What is Mohr's Circle? **1**

5A. A boiler is subjected to an internal steam pressure of 2 N/mm^2. The thickness of boiler plate is 2 mm and permissible tensile stress is 120 N/mm^2. Find out the maximum diameter, when efficiency of longitudinal joint is 90% and that of circumferential joint is 40%. **3**

5B. A thick metallic cylindrical shell of 150 mm internal diameter is required to withstand an internal pressure of 8 N/mm^2. Find the necessary thickness of the shell, if the permissible tensile stress in the section is 20 N/mm^2. **3**

5C. Find the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the column as 2.3 m and hinged at its both ends. Take E= 205 GPa. **4**
Also determine crippling load by Rankine's formula using constants as 335 MPa and 1/7500.

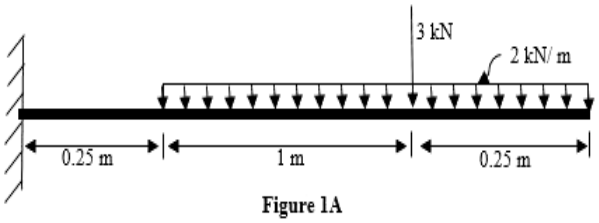

Figure 1A

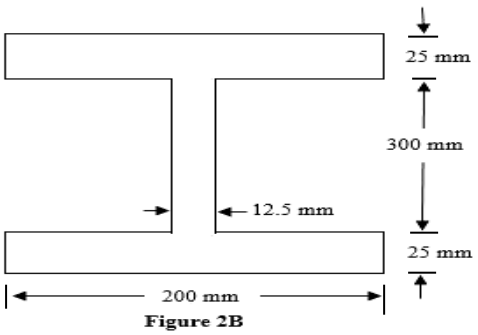

Figure 2B

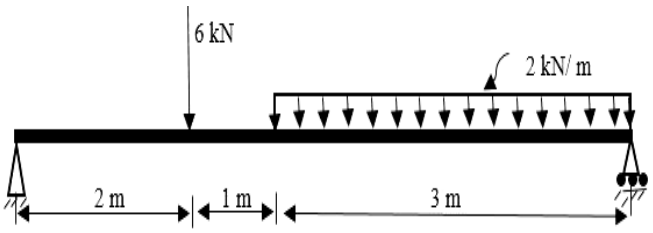

Figure 3B

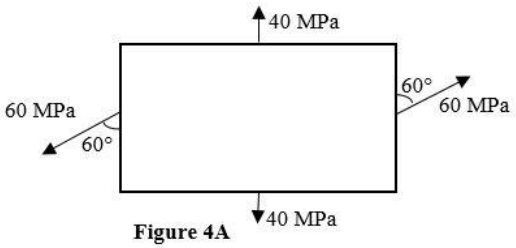

Figure 4A