Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

IV SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2018

SUBJECT: STRENGTH OF MATERIALS [CIE 3283]
REVISED CREDIT SYSTEM

(30/ 04/ 2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitably assumed.

Q.No		Marks	CO
1A.	Define:(i) Neutral axis (ii) Section modulus (iii) Elastic curve (iv) Hooke's law	**2**	**CO1**
1B.	A simply supported beam of span 5m carries an UDL of W/unit run over the entire span. The beam has a cross section of 200mmx 300mm. Calculate the intensity of UDL that the beam can carry if the bending stress is limited to 50 MPa. Factor of safety to be employed is 5.	**3**	**CO1**
1C.	A cantilever beam 300 mm x 400 mm in section weighing 7.5 kN/m is subjected to a load of 5 kN as shown in **Figure1C**. Determine the maximum bending stress developed at a section 2 m from free end. Sketch the stress distribution diagram	**5**	**CO1**
2A.	A shear force of 50 kN acts on a beam whose cross section details are as shown in **Figure 2A**. The moment of inertia of section about neutral axis is 2.849×10^8 mm^4. Calculate the shear stress distribution over the depth of section and sketch the shear stress distribution.	**5**	**CO1**
2B.	Determine the deflection at Band D for a beam shown in Figure 2B. Take E = 210 GPa and $I = 1.6 \times 10^7$ mm^4.	**5**	**CO2**
3A.	Derive torsional equation for a solid circular shaft, considering usual notations	**3**	**C03**
3B.	A solid circular shaft has to transmit a power of 1000 KW at 2 RPS. Find the diameter of shaft if the shear stress is not exceed 80 MPa. Maximum torque is 1.25 times the average torque, what is percentage of material which could be saved if the shaft is replaced by a hollow one, whose internal diameter is 0.6 times the external diameter. The length of shaft and maximum shear stress of material remain same.	**5**	**C03**
3C.	Define: (i) Polar modulus (ii) Torsional rigidity (iii) Torsion (iv) Torsional stiffness	**2**	**C03**
4A.	Define principal stresses and principal planes	**1**	**C04**
4B.	A two dimensional stress system acting on an element in a body consist of tensile stresses of magnitude 100 MPa and 60 MPa on mutually perpendicular planes together with shear stress of magnitude 50 MPa. Find	**5**	**C04**

	principal stresses their planes, maximum shear stress and its planes. Represent answers with neat sketches		
4C.	A cylindrical shell 90 cm long, 20 cm internal diameter having thickness of metal as 8 mm is filled with fluid at atmospheric pressure. If an additional 20 cm^3 of fluid is to be pumped into the cylinder, find (i) the pressure exerted by fluid on the cylinder and (ii) the hoop stress induced. Take E= 200 Gpa and Poisson's ratio = 0.3	**4**	**C04**
5A.	Find the thickness of the metal necessary for a cylindrical shell of internal diameter 160mm to withstand an internal pressure of 8000KPa. The maximum hoop stress in the section is not to exceed 35MPa.	**4**	**C04**
5B.	Define Buckling load and slenderness ratio.	**2**	**C05**
5C.	**Figure 5C.** shows the section of a steel column of 3m length and whose ends are hinged. Calculate the safe load that the column can carry if factor of safety = 3. Assume f_c = 350 MPa and Rankine's constant = 1/7500.	**4**	**C05**

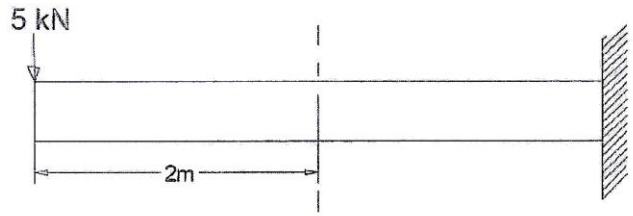

Figure.1.c

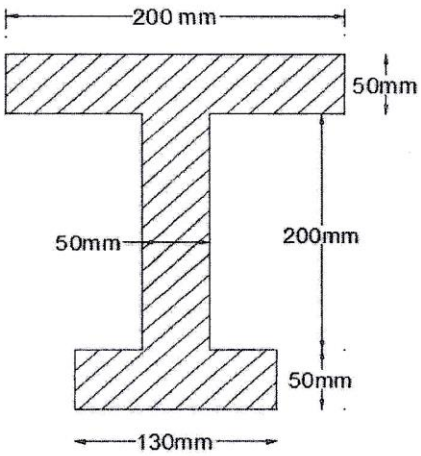

Figure.2.a

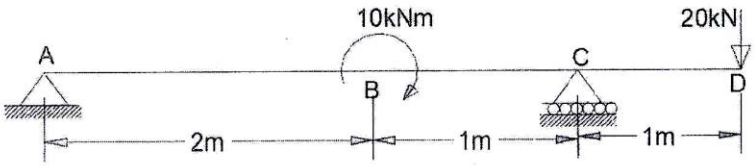

Figure.2.b

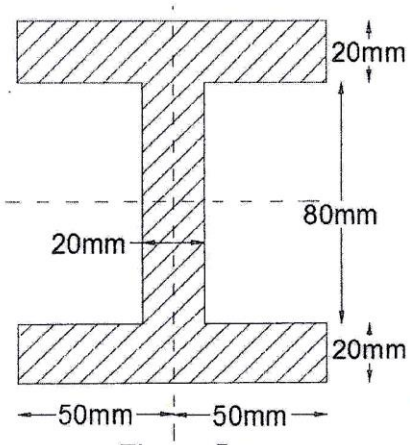

Figure.5.c