Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

(Constituent Institute of Manipal University, Manipal)

III SEMESTER, B.TECH. (MECHANICAL/IP ENGINEERING)
END SEMESTER EXAMINATION – DEC 2015/JAN 2016

SUBJECT: STRENGTH OF MATERIALS (MME-2103)
(REVISED CREDIT SYSTEM)

Time: 3 Hours. **[05 – 01 – 2016]** **MAX.MARKS: 50**

Instructions to Candidates:

- Answer **ALL** questions.
- Assume missing data, if any, suitably.
- Sketches for Q4(b), Q4(c), Q5(a) and Q5(b) are given page 2 of 2.

1(a) A thin cylinder of 3.25m long and 250mm inner diameter is subjected to an internal pressure of 1.2 MPa. If the thickness of the shell is 10 mm find the circumferential and longitudinal stresses. Find also the maximum shear stress induced in the shell. (03)

1(b) The cross section of a column is a hollow rectangle of 200mm x 150 mm external dimensions. The wall thickness is 50 mm. Find Euler's load and Rankine load if the effective length is 5m and both ends are fixed. Take σc = 400 MPa and a= 1/1600 and E = 200 GPa. (04)

1(c) List assumptions in the theory of pure bending. (03)

2(a) Derive the equation for torsion of shafts with neat sketches. (04)

2(b) List the differences between long column and short column. (02)

2(c) Derive the expression for slope and deflection in a cantilever supported beam subjected to a uniformly distributed load using double integration method. (04)

3(a) Draw neat sketches and derive an expression for shear stress developed in a beam. (04)

3(b) Obtain the expression for shear force and bending moment in a cantilever supported beam subjected to point load at the free end and draw the SFD & BMD. (03)

3c) Define the following.
i. Bulk modulus
ii. Endurance limit
iii. Modulus of rigidity (03)

4(a) Explain the steps involved in the construction of Mohr's Circle with a neat sketch. (03)

4(b) An overhanging beam ABC is loaded as shown in figure Q4(b). Find the slopes over each support. Find also the maxumum deflcetion between the supports and deflection at the right end.Use Macaulay's method. (04)

4(c) The cross section of a beam is as shown in fig.Q4(c). If permissible stress is 20 N/mm^2. Find its moment of resistance. (03)

5(a) A stepped steel shaft as shown in fig. Q5(a) is subjected to a torque T at the free end and a torque 2T in opposite direction at the junction of the two sizes. What is the total angle of twist at the free end, if the maximum shear stress in the shaft is limited to 70 MPa? Take G=84 GPa. (04)

5(b) Compute the shear force and bending moments for the beam loaded as shown in fig Q5(b) and plot the SFD and BMD. (04)

5(c) Derive the expressions for circumferential stress and longitudinal stress in thin cylinders. (02)

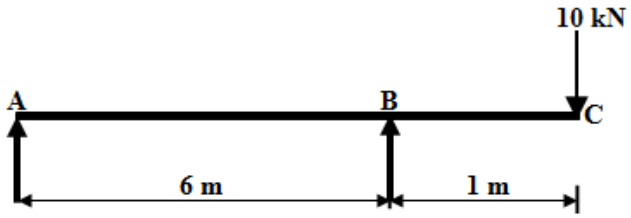

Fig. Q4(b)

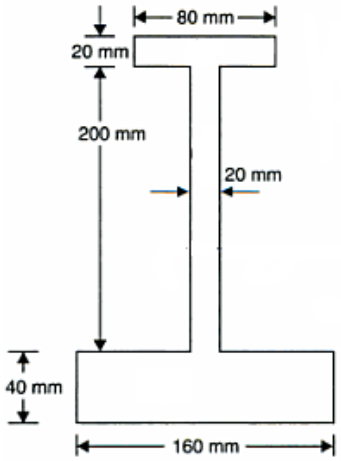

Fig. Q 4(c)

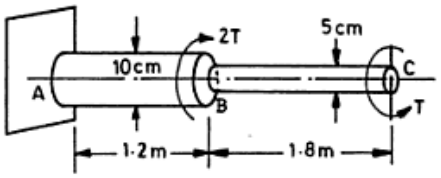

Fig 5(a)

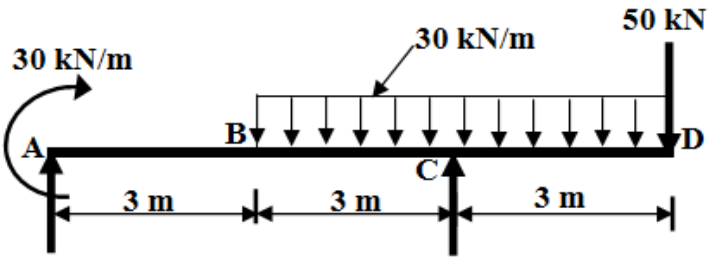

Fig. Q5(b)