Total No. of printed pages = 3

CT-303/SM/3rd Sem/2013/M

STRENGTH OF MATERIALS

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. (a) What does SFD and BMD mean for a particular beam under loading? 4

   (b) For torsion of circular shaft, prove that $\frac{\tau}{R} = \frac{T}{J} = \frac{C.\theta}{l}$, where symbols have their usual meaning. 6

2. (a) List out the assumptions made in theory of torsion. 4

   (b) The diameter of the shaft is 150 mm. Calculate the maximum torque it can transit safely if the shear stress is limited to 50 MPa and maximum value of angle of twist is limited to $0{\cdot}5^{\circ}$ per metre length of shaft. Given C = 80 GPa. 6

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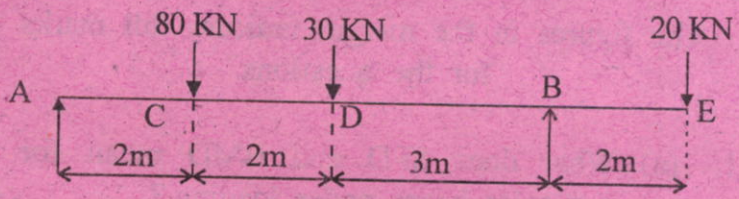
3. For columns with one end fixed and other end free, prove that $P = \frac{\pi^2 EI}{4l^2}$, where symbols have their usual meaning. 10

4. Draw BMD and SFD for the single over hanging beam loaded as shown in figure. 10



5. In an experiment a bar of 30 mm diameter is subjected to a pull of 50 KN. The measured extension on gauge length of 300 mm is 0·09 mm and the change in diameter is 0·0038 mm. Calculate the Poisson's ratio and the values of the three modulii. 10

6. Find 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 2·3m and hinged at its both ends. Take E = 205 GPa.

   Also determine crippling load by Rankine's formula using constants as 335 MPa and $\frac{1}{7500}$. 10

7. An I-section is made up of three rectangles as shown in figure. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section. 10