

07.12.17

Q.P. Code: 27344

Duration: 3 Hours

Total Marks: 80

**N.B.:** 1. Question No 1 is compulsory

2. Attempt any **Three** questions from the remaining five questions.
3. Assume any **suitable data** if necessary with justification.
4. Figures to the right indicates max. marks

Q.1. Attempt any **four** of the following questions.

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- a) Draw the shear force and bending moment diagram for a cantilever beam with uniformly distributed load and a concentrated load at the free end.
- b) A cantilever 3 m long carries a UDL over the entire length. Find the deflection at the free end if the slope at the free end is  $3^\circ$ .
- c) Derive the relation between E G K.
- d) Obtain an expression for strain energy stored due to torsion in a solid shaft.
- e) A bar of 12 mm in diameter is acted upon by an axial load of 20 KN. The change in diameter is measured as 0.003 mm. Determine (i) the Poisson's ratio and (ii) the modulus of elasticity and the bulk modulus. The value of modulus of rigidity is 80 GPa.

Q.2 a) A steel tube of 35 mm outer diameter and 30 mm inner diameter encloses a gun metal rod of 25 mm diameter and is rigidly joined at each end. If at a temperature of 400°C there is no longitudinal stress, determine the stress developed in the rod and the tube when the temperature of the assembly is raised to 240°C. Take, 10

Young's modulus for steel = 205 GPa ,

Young's modulus for gun metal = 91.5 GPa

Coefficient of thermal expansion of steel =  $11 \times 10^{-6} / ^\circ\text{C}$ Coefficient of thermal expansion of gun metal =  $18 \times 10^{-6} / ^\circ\text{C}$ .

Also find the increase in length if the original length of the assembly is 1 m.

- b) Draw the shear force and bending moment diagram for a simply supported beam as shown in the figure. 10

