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Printed Pages : 3 **ME – 408**

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 4048** Roll No. | | | | | | | | | | |

# B. Tech.

## (SEM. IV) EXAMINATION, 2006-07

## APPLIED MECHANICS

*Time : 2 Hours]* *[Total Marks : **50***

***Note :*** *(1) Attempt **all** the questions.*
*(2) Assume suitably the missing data, if any.*

**1** Attempt any **four** parts of the following : **3.5×4**

a) Explain engineering stress and strain, true stress and strain.

b) A circular rod of diameter 20 mm and 500 mm long is subjected to a tensile force of 45 kN. The modulus of elasticity for steel may be taken as 200 kN/mm$^2$. Find stress, strain and elongation of the bar due to applied load.

c) Find the modulus of elasticity for a rod, which tapers uniformly from 30 mm to 15 mm diameter in a length of 350 mm. The rod is subjected to an axial load of 5.5 kN and extension of the rod is 0.025 mm.

d) Define and explain the terms : longitudinal strain, lateral strain, and Poisson's ratio.

e) What do you understand by 'An element in a state of simple shear'?

f) A bar of uniform cross section A and length L is suspended from top Find the expression for extension of the bar due to self weight only if Young's modulus is E and unit weight of the material is Y.

**2** Attempt any **two** parts of the following : **6×2=12**

a) A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Calculate Young's modules and bulk modules.

b) At a certain point in a stained material, the stresses on two planes, at right angles to each other are 20 N/mm2 and 10 N/mm2 both tensile. They are accompanied by a shear stress of a magnitude of 10 N/mm2. Find the location of principal planes and evaluate the principal stresses.

c) A water main 80 cm diameter contains water at a pressure head of l00m. If the weight density of water 9810 $N/m^3$, find the thickness of the metal required for the water main. Given the permissible stress as 20 $N/mm^2$.

**3** Attempt any **two** parts of the following : **6×2=12**

a) A cantilever carries a uniformly distributed load of 1 kN per metre for a length of 4 meters form its supported end and a point load of 3 kN at the free end at a distance of 6 m from the support. Draw the shear force and bending moment diagrams.

b) A rectangular beam 300 mm deep is simply supported over a span of 4 metres. Determine the uniformly distributed load per metre which the beam may carry, if the bending stress should not exceed 120 N/mm$^{2.}$ Take I = 8 x 10$^{6}$ mm$^{4.}$

c) A thin tube of length L, diameter d and weight density w per unit volume is used to transmit the torque. The maximum permissible stress for the shaft material is $\tau$. Determine the torsional strength to weight ratio.

**4** Attempt any **two** parts of the following : **6×2=12**

a) A flat bar 120 mm wide and 12 mm thick carries an axial pull of 120 kN. A 12 mm diameter hole is punched with its centre at a distance of 36 mm from the axis of the bar. Find the maximum and minimum stresses at the weakest section.

b) A beam 3 m long, simply supported at its ends, is carrying a point load w at the centre. If the slope at the ends of the beam should not exceed 1°, find the deflection at the centre of the beam.

c) A column of timber section 15 cm x 20 cm is 6 m long both ends being fixed. If the young's modulus for timber = 17.5 kN/mm$^{2}$, determine buckling load.