**D 32967** (Pages : 2) Name.....

Reg. No.....



# THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2012

## EE 04 303—STRENGTH OF MATERIALS

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

I. (a) What is meant by volumetric strain ? Derive the expression for volumetric strain.

(b) Explain Mohr's circle of stresses.

(c) Derive the relationship between shear force, bending moment and load distribution.

(d) Explain the limitations of simple bending theory.

(e) Explain the terms slope and deflection of a beam. What are the causes of deflection ?

(f) Explain the advantages of hollow shaft over solid shaft in power transmission.

(g) What are the different types of columns ? Write their equivalent lengths.

(h) Explain the tension testing of an elastic material.

(8 × 5 = 40 marks)

II. (a) A railway is laid in such a way that at 30°C, there is no stress in the rails. What would be the stress in the rails at 0°C if no contraction is allowed ? E = 200 GPa, $\alpha = 11 \times 10^{-6}$/°C. Determine also the stress at 0°C if a contraction of 5 mm is allowed per rail whose length is 30 m.

(15 marks)

*Or*

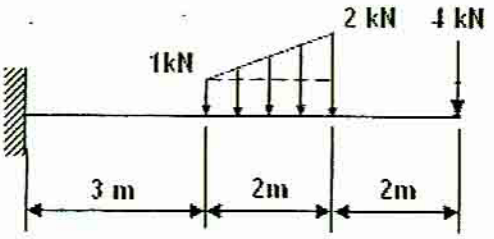
(b) Direct and shear strains at stressed point in a body is given below.

$\varepsilon_x = 0.001, \varepsilon_y = 0.0008, \gamma_{xy} = 0.0006.$

Calculate the magnitude and directions of the principal stresses. For the body material E = 210GPa, and G = 80 GPa.

(15 marks)

III. (a) Draw the shear force and bending moment diagram for the cantilever shown in figure.




(15 marks)

*Or*

**Turn over**

(b) A steel pipe of 200 mm mean diameter and 5 mm thickness carries a uniformly distributed load of 1kN/m over its entire length of 10 m. Calculate the maximum intensity of shear stress in the pipe. (15 marks)

IV. (a) A concentrated load of W when applied at the free end of a cantilever produces there a deflection of 6 mm. If the same load is applied in a uniformly varying manner with load at fixed end equal of zero, determine the deflection of the free end. (15 marks)

*Or*

(b) Calculate the ratio of the torques transmitted by a hollow and solid shaft of the same material, length and weight. (15 marks)

V. (a) In a thick cylinder with internal pressure of 6 MPa, the circumferential stress at the outside surface is 20 MPa. Calculate the circumferential stress at the outside surface and at the point where the radial stress is 3 MPa. Find out the longitudinal stress if the cylinder is closed at the ends and the inside diameter is 200 mm. (15 marks)

*Or*

(b) Two plates 120 mm × 10 mm each are welded to the ends of another plate 200 mm × 10 mm to form an I section. The sides of the fillet welds is 6 mm. Determine the maximum shear force to which the section can be subjected freely. The maximum permissible shear stress in the weld is 100 MPa. (15 marks)

[4 × 15 = 60 marks]