D 23519 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2011

EE 04 303—STRENGTH OF MATERIALS

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

I. (a) What is stress ? Explain different types of stresses.

(b) Derive the expressions for the normal and shear stresses on any oblique plane subjected to tensile loading in the axial direction.

(c) What are the different types of beams ?

(d) What is a flitched beam ? Why is it used ?

(e) Explain the method of successive integration.

(f) Derive the expression for the shear stress produced when a tube is subjected to twisting.

(g) Write the Lame's equations for the determination of stresses in a thick cylinder. What are the assumptions made ?

(h) Explain any one method of hardness testing.

(8 × 5 = 40 marks)

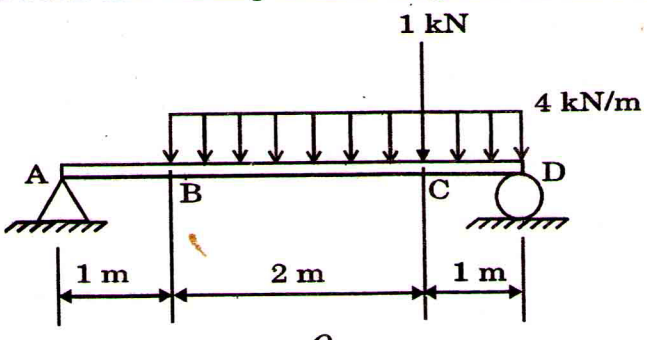
II. (a) A 50 mm diameter steel bar is subjected to a tensile load of 100 kN. The extension over its 300 mm length was found to be 0.08 mm and change of its diameter was 0.0035 mm. Determine the modulus of rigidity of the bar.

Or

(b) At a point in a material component, $\sigma_x = 500$Mpa (tensile), $\sigma_y = 10$Mpa (tensile) and and $\tau = 20$Mpa. Use Mohr's circle to determine : (i) the planes on which shear stress is maximum, (ii) principal planes and (iii) the stress components on these planes.

(15 marks)

III. (a) Draw the Shear Force and Bending Moment diagrams for the beam shown in figure below :



Or

(b) A horizontal beam of rectangular section of 100 mm deep and 50 mm width is simply supported on a 2 m span and a vertical load of 5 kN applied at the centre. Besides a horizontal pull of 40 kN is also applied at the ends through centre. Determine the resultant stress on the beam.

(15 marks)

Turn over

IV. (a) A concentrated load when applied at the mid span of a simply supported beam 6 m long, produces a slope of 1° at the ends. Determine the deflection at the mid span.

Or

(b) A solid circular shaft of 30 mm diameter transmits a torque of 300 Nm. Calculate the length of the shaft if the twist is not to exceed 5°. G = 80 GPa.

(15 marks)

V. (a) A hollow metallic tube of 60 mm external diameter, 50 mm internal diameter and 8 m long is fixed at one end and its upper end is free. Calculate the maximum load that it can withstand. E = 200 GPa, Crushing strength of the material = 300 MPa, Rankine's constant = 1/7500.

Or

(b) The ends of a cylindrical boiler shell are joined to the main shell by a double riveted lap joint. The thickness of the boiler shell is 15 mm, the rivets used are of 20 mm diameter at 60 mm pitch. Determine the joint efficiency if permissible tensile stress in the plates is 100 MPa and the maximum allowable shear stress in the rivets is 80 MPa. The bearing stress in the joint should also not exceed 150 MPa.

(15 marks)

[4 × 15 = 60 marks]