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B.E DEGREE EXAMINATIONS , APRIL/MAY 2012

INDUSTRIAL,MANUFACTURING,MINING ENGINEERING AND PRINTING TECHNOLOGY

III SEMESTER

CE 9213 STRENGTH OF MATERIALS

Time : 3 Hours Max.Marks: 100

Answer ALL questions

Part-A (5x2=10 marks)

1. A circular metal rod 8 mm diameter is subjected to a pull of 6 kN and the extension was 0.1 mm for a length of 600 mm. Find the Young's modulus.
2. The Young's modulus of steel is 210 kN/mm^2 and the Young's modulus of copper is 105 kN/mm^2. What is the modular ratio.
3. Define shear force and bending moment?
4. Draw the shear force diagram for a cantilever beam of span 3m carrying a point load 10kN at free end.
5. Draw the shear stress distribution in an I-section due to bending.
6. What do you mean point of contraflexure?
7. State Castigliano's second theorem?
8. Sketch any two conjugate beams and the corresponding real beams.
9. Write down the Lame's equation?
10. Write down the expression for hoop and longitudinal stresses in thin cylinders.

Part-B (5x16=80 marks)

11. Draw the shear force and bending moment diagrams for the beam shown in Fig.Q.11. and locate the points of contraflexure if any.

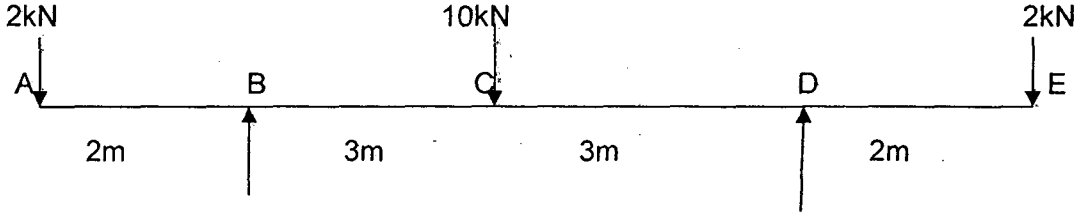

Fig.Q11

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12.a) Stresses at a point are p_x=60N/mm^2, p_y =-40N/mm^2, q=75 N/mm^2. Determine principal planes , principal stresses and maximum shear stress.

(or)

b) A copper bar 30 mm diameter is completely enclosed in a steel tube, 30 mm internal diameter and 50 external diameter. The ends are tightly fixed. Find the stresses in steel and copper when the temperature is raised by 50^{0}C.

Take $E_c = 1 \times 10^5$ N/mm^2 $E_s = 2 \times 10^5$ N/mm^2

$\alpha_c = 17 \times 10^{-5}$ per °C $\alpha_s = 11 \times 10^{-6}$ per °C.

13a) A closed coiled helical spring is to have a stiffness of 3 N/mm in compression with a maximum load of 100N and maximum shearing stress of 105 N/mm^2. The solid length of the spring (i.e., coils are touching)is 60 mm. Find the diameter of wire, mean diameter of coil and the number of coils. C=80kN/mm^2.

(or)

b) A hollow shaft with diameter ratio 3/5 is required to transmit 450 kW at 120 rpm. The shear stress in the shaft is not to exceed 60 N/mm^2 and the twist in a length of 2.5 m must not exceed l°. Calculate the diameters of the shaft. Take G = 8×10^4 N/mm^2.

14.a) Find deflection at C and maximum deflection for the beam shown in fig.Q.14.a.
E = 2×10^5 N/mm^2, I = 3×10^7mm^4.

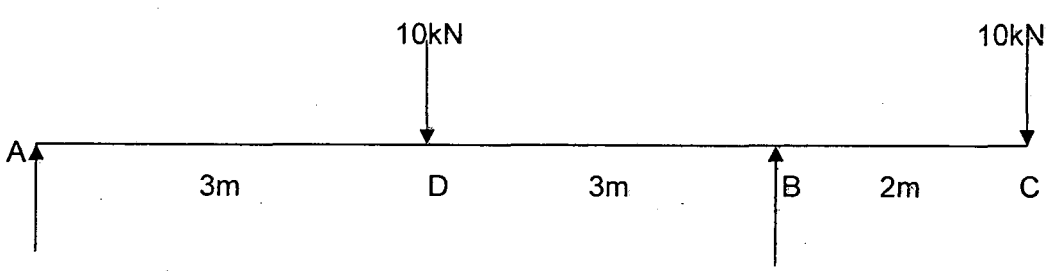

Fig.Q14a

(or)

b) Using conjugate beam method, compute deflection at C, slope at A and slope at B for the beam shown in Fig.Q.14.b. Take E = 2 x 10^5 N/mm^2 and I = 8 x 10^7 mm^4.

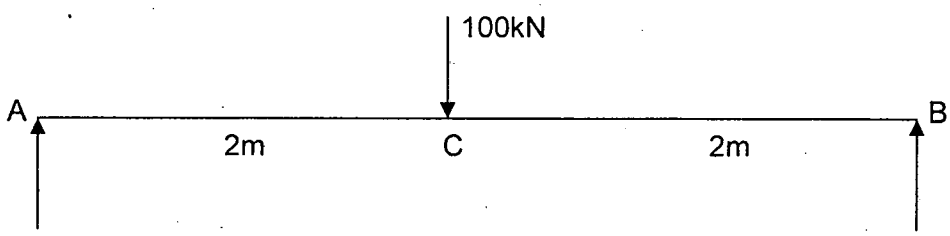

Fig.Q14b

15a) A cylindrical shell is 3 m long, 1 m internal diameter and 15 mm wall thickness. It is subjected to an internal pressure of 1.5 N/mm^2. Find the change in length, change in diameter and change in volume. E=204 kN/mm^2, ν=0.3

(or)

b) Find the thickness of metal necessary for thick cylindrical shell of internal diameter 160mm to withstand an internal pressure of 10N/mm^2. The hoop stress in the section is not to exceed 45N/mm^2.

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