Roll No. | | | | | | | | | | |

B.E. / B.Tech (Part Time) End Semester DEGREE EXAMINATION, APRIL / MAY 2012

First Semester

Civil Engineering

PTCE 9201 – STRENGTH OF MATERIALS - I

(Regulation 2009)

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. A bar of varying cross–section consists of two sections of lengths l_1 and l_2 with cross–sections A_1 and A_2. It is subjected to an axial pull F. Find the total elongation.
2. The Young's modulus of a material is 200 kN/mm^2 and its rigidity modulus is 80 kN/mm^2. Determine its bulk modulus.
3. List the procedure for the analysis of 2 D frames using the tension coefficient method.
4. What do you mean by "Perfect Frame"?
5. What is point of contra flexure? In which beam will it occur?
6. Define flitched beam.
7. State the fundamental assumptions normally made in the theory of torsion.
8. Distinguish between close coil and open coil helical springs.
9. State the moment area theorems and the condition where it is used.
10. Draw the conjugate beam for a cantilever beam loaded with point load at the free end.

Part –B (5 x16 = 80 Marks)

11. An overhanging beam is loaded as shown in Fig.Q.No.11. Draw the Shear Force Diagram and Bending moment Diagram and also find out the point of contraflexure if any.

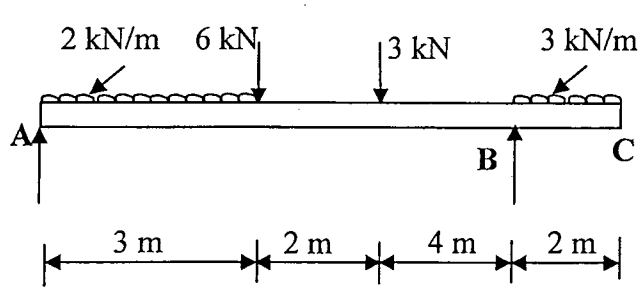


Fig.Q.No.11

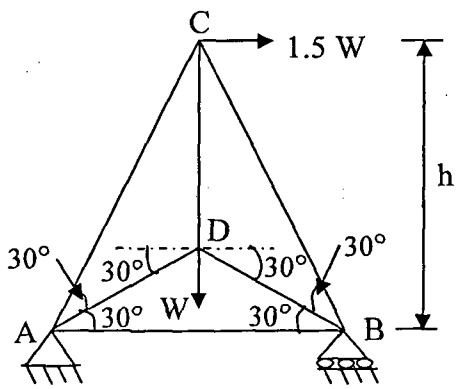
12 (a) A flat bar of aluminum alloy, 30 mm wide and 8 mm thick is placed between two steel bars each 30 mm wide and 10 mm thick, to form a composite bar 30 mm x 28 mm. The three bars are fastened together at their ends when the temperature is 12°C. Find the stress in each of the material when the temperature of the whole assembly is raised to 42°C. Take $E_s = 2 \times 10^5$ N/mm^2, $E_a = 0.7 \times 10^5$ N/mm^2 , $\alpha_s = 12 \times 10^{-6}$ per °C and $\alpha_a = 23 \times 10^{-6}$ per °C.

OR

12 (b) At a point in a strained material, there are two planes at right angles to each other on which the normal stresses are 75 MN/m^2 Tensile on one plane and 45 MN/m^2 compressive on the other plane accomplished by a shear stress. If the major principal stress is 105 MN/m^2 Tensile, evaluate the maximum shear stress on the two planes.

13 (a) Determine the forces in the members of the frame shown in Fig.Q.No.13(a).

Fig.Q.No.13(a)



OR

13(b) Using the method of Tension Coefficient, determine the forces in the members of the crane structure shown in Fig. Q.No.13(b).

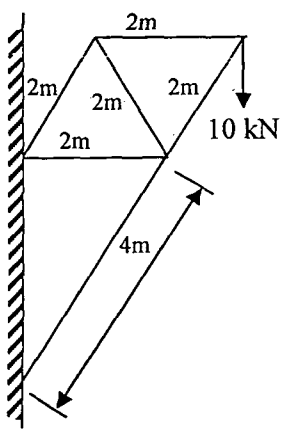


Fig. Q.No.13(b)

14(a) A hollow shaft is to transmit 300 kW at 80 rpm. The internal diameter is 0.6 of the external diameter. The maximum torque is 40% more than the mean torque. If the shear stress is not to exceed 60 N/mm^2, find the external and internal diameters of the shaft.

OR

14(b) A shaft ABC of 500 mm length and 40 mm external diameter is bored, for a part of its length AB, to a 20 mm diameter and for the remaining length BC to a 30 mm diameter bore. If the shear stress is not to exceed 80 N/mm^2, find the maximum power, the shaft can transmit at a speed of 200 r.p.m. If the angle of twist in the length of 20 mm diameter bore is equal to that in the 30 mm diameter bore, find the length of the shaft that has been bored to a 20 mm and 30 mm diameter.

15(a) A simply supported beam of uniform flexural rigidity EI and span l, carries two symmetrically placed loads P at one–third of the span from each end. Find the slope at the supports and the deflection at mid–span. Use moment area theorems.

OR

15(b) A beam with variable moment of inertia is loaded as shown in Fig.Q.No.15.b. Find the deflection at B and slope at A by conjugate beam method. Take $E = 2 \times 10^5$ N/mm^2 and $I = 2 \times 10^{10}$ mm^4.

Fig.Q.No.15 b