Reg. No. :

Question Paper Code : X10230

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Third Semester
Civil Engineering
CE 8301 – STRENGTH OF MATERIALS – I
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. State Hooks Law.
2. If the Young's modulus of a material is 200kN/mm^2 and its rigidity modulus is 80 kN/mm^2. Determine its Bulk modulus.
3. A simple supported beam of length 'L' carries a moment 'M' acting clockwise direction at the middle. Draw the shear force diagram for the beam.
4. Find the flexural rigidity of a circular beam of span 4m and having a diameter 150mm. Take Young's modulus as E = 200 GPa.
5. What are the methods for finding out the slope and deflection at a section ?
6. What is the maximum deflection at the free end of the cantilever beam carrying a UDL of 'w'/m over the entire span 'I' ?
7. Write the section modulus of a solid shaft having a diameter 'd'.
8. Differentiate closed coil and open coil spring.
9. For the truss shown in figure Q.9. Find the reactions at the two supports.

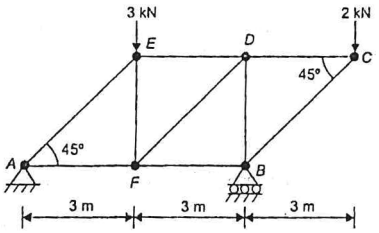

Figure Q.9.

10. Define tension coefficient method.

PART – B **(5×13=65 Marks)**

11. a) Three bars made of copper, zinc and aluminium are of equal length and have cross section 500, 750 and 1000 square mm respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 250 kN, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = 1.3×10^5 N/mm^2, for Zinc = 1.0×10^5 N/mm^2 and for aluminium = 0.8×10^5 N/mm^2.

(OR)

b) For the plane stress system shown in Fig Q.11 (b), find the major and minor principal stresses and the planes on which they act. Also find the maximum shear stresses and the planes on which they act.

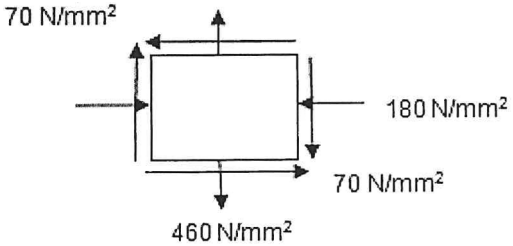

Figure Q.11 (b)

12. a) For the beam shown in fig. Q.12 (a) Draw the shear force and bending moment diagram.

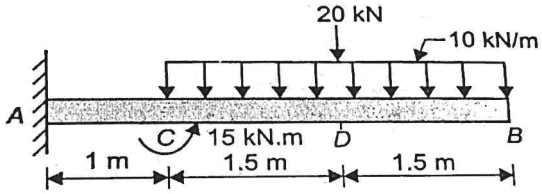

Figure Q.12 (a)

(OR)

b) A simply supported beam of length 3m carries a point load of 12 kN at a distance of 2m from left support. The cross section of the beam is shown in fig. Q. 12 (b). Find the maximum tensile and compressive stress.

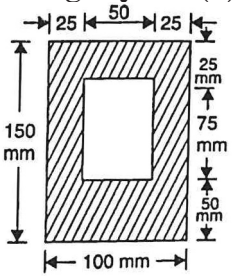

Figure Q.12 (b)

13. a) For the loaded beam shown in figure Q. 13 (a). Determine the deflection at point C. Take E = 2×10^5 N/mm^2 and I = 5×10^8 N/mm^4.

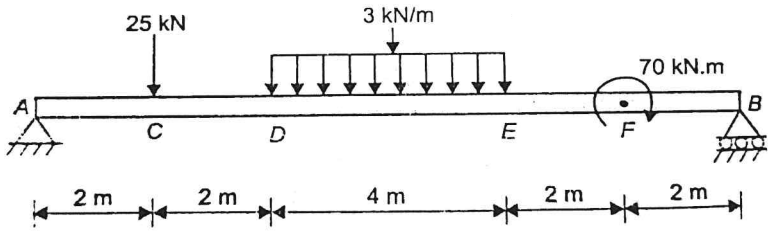

Figure Q.13 (a)

(OR)

b) A simply supported beam of uniform cross section carries a UD load 'w'kN/m throughout its length. Calculate the slope and deflection at the mid point by moment area method.

14. a) A hollow steel shaft, having an internal diameter 40% of its external diameter, transmits 220 kW of power at 100 rpm. The total angle of twist in a length of 4 m of the shaft is 2°. Find the inner and outer diameters of the shaft if the permissible shear stress is 45 MPa. G = 80 GPa. Assume maximum torque = 1.2 mean torque.

(OR)

b) A close coiled helical spring has its free length as 120 mm. It absorbs 40 Nm of energy when fully compressed and the coils are in contact. The mean coil diameter is 80 mm. Determine the diameter of the steel wire required and the number of coils if the maximum shear stress is to be 120 MPa. G = 82 GPa.

15. a) Find the forces in the members of the truss shown in fig.Q.15 (a) by method of joints.

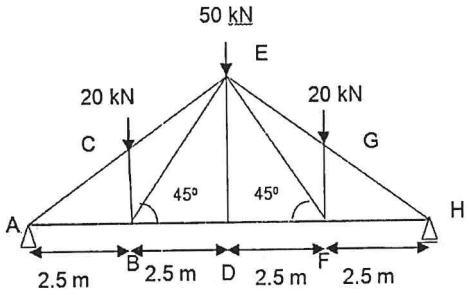

Figure Q.15 (a)

(OR)

b) Find the forces in the EF, CF, CB members of the truss shown in fig. Q.15 (b) by method of section.

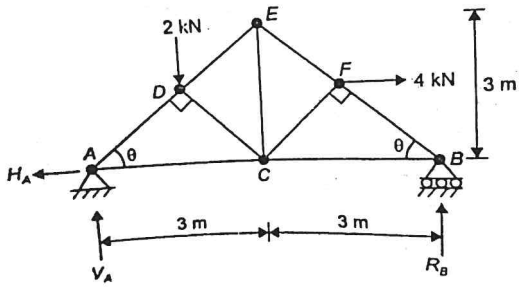

Figure Q.15 (b)

PART – C **(1×15=15 Marks)**

16. a) Find the slope at A & B and deflection at 'D' of a simple beam as shown in fig. 16 (a). Take E = 200 GPa and I = 3×10^{-3} m^4. Use conjugate beam method.

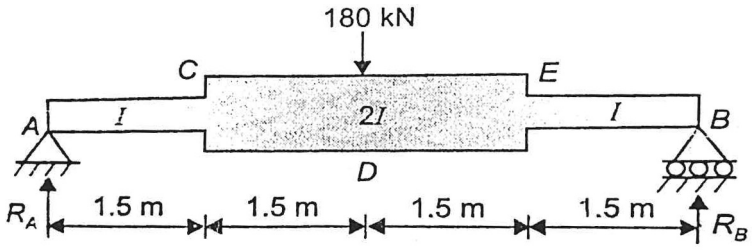

Figure Q.16 (a)

(OR)

b) A steel shaft ABCD having a total length of 2.4 m consists of three lengths having different section as follows : AB is hollow having outside and inside diameters of 80 mm and CD a diameter of 70 mm. If the angle of twist is the same for each section, determine the length of each section and the total angle of twist is the same for each section, determine the length of each section and the total angle of twist if the maximum shear stress in the hollow portion is 50 N/mm^2. Take C = 8.2×10^4 N/mm^2.