CE8301 STRENGTH OF MATERIALS – I

Important 13 Mark Questions

Part-B

1. A rod 200cm long and of diameter 3 cm is subjected to an axial pull of 30kN. If the Young's Modulus of the material of the rod is 2 x 10^5 N/mm^2. Determine (i) Stress, (ii) Strain, (iii) Elongation of the rod
2. Find the Young's Modulus of rod of diameter 30 mm and of length 300 mm which is subjected to a tensile load of 60kN and the extension of the rod is equal to 0.4 mm.
3. Determine the changes in length, breath and thickness of a steel bar which is 5 m long, 40 mm wide and 30 mm thick and is subjected to an axial pull of 35 kN in the direction of its length. Take E=2 x 10^5 N/mm^2 and poisson's ratio = 0.32.
4. Determine the value of young's modulus and poisson's ratio of a metallic bar of length 25 cm, breath 3 cm and depth 2 cm when the bar is subjected to an axial compressive load of 240 kN. The decrease in length is given as 0.05 cm and increase in breath is 0.002.
5. A overhanging beam ABC of length 6 m is supported at A and B. The overhanging portion BC is of 2 m length. A udl of intensity 2 kN/m acts over the entire span. Two-point loads of intensity 5 kN and 3 kN act at a distance of 2 m from the left support A and at the free end C respectively. Draw the SFD and BMD. Also locate the point of contraflexure.
6. A Simply supported beam 6 m long is carrying a uniformly distributed load of 5 kN/m over a length of 3 m from the right end. draw the SFD and BMD for the beam and also calculate the maximum bending moment on the beam.
7. A cat iron test beam 2 cm x 2 cm in section and 1 m long and supported at the ends fails when a central load of 64 kg is applied. What uniformly distributed load will break a cantilever of the same material 5 cm wide,10 cm deep and 2 m long?
8. A beam 500 mm deep of a symmetrical section has I = 1 x 10^8 mm^4 and is simply supported over a span of 10 m. calculate (1) The uniformly distributed load it can carry if the maximum bending stress is not to exceed.
9. A steel joist, simply supported over a span of 6 m carries a point load of 50 kN at 1.2 from the left-hand support. Find the position and magnitude of the maximum deflection. Take EI = 14 X 10 12 N/mm2

10. A cantilever beam 50 mm wide and 80 mm deep is 2 m long. It carries a UDL over the entire length along with a point of 5 kN at its free end. Find the slope at the free end when the deflection is 7.5 mm at the free end. Take E = 2 x 10^5 N/mm^2.
11. A simply supported beam of span 3 m is subjected to a central load of 10 kN. Find the maximum slope and deflection of the beam. Take I=12 ×106 mm4 and E = 200 GPa.
12. A cantilever beam of length 7 m carries a UDL of 18 kN/m over a length of 3m from the free end along with a point load 2 kN at 3 m from free end. Determine the deflection at the free end of the beam. Take E = 2.1 x 10^5 N/mm^2 and I = 1.2 x 10^8 mm^4 .
13. A hollow shaft is to transmit 3oo kW at 100 rpm. If the shear stress is not to exceed 60 N/mm^2 and the internal diameter 0.6 times the external diameter. Find the internal and external diameter of the shaft. The maximum torque exceeds the mean by 10%.
14. A circular shaft is subjected to a torque of 10kNm. The power transmitted by the shaft is209.33kW. Find the speed of shaft in revolution per minute.
15. A circular shaft of 1000mm diameter and 2m length is subjected to a twisting moment which creates a shear stress of 20N/mm2 at 30mm from the axis of the shaft. Calculate the angle of twist and the strain energy stored in the shaft. Take G=8x104 N/mm2.
16. A solid circular shaft transmits 70 kW power at 175 rpm. Calculate the shaft diameter, if the twist in the shaft is not to exceed 2^0 in 2 m length of shaft and shear stress is limited to 50x10^3 kN/m^2. Take C = 100 x 10^3 MN/m^2
17. Show that in thin cylinder subjected to internal fluid pressure, the hoop stress is twice the longitudinal stress.
18. For the truss shown in fig find the forces in members CD, CB, BD and AE by method of joints.
19. A thin cylindrical shell 1000 mm long, 200 mm in external diameter, thickness of metal 10 mm is filled with a fluid at atmosphere pressure. If an additional 25 cm3 of the fluids at atmospheric find the pressure exerted by the fluid on the wall. Take E = 2 x 105 N/mm2 and Poisson's ratio = 0.3. Find also the hoop stress induced.
20. For the truss shown in fig find the forces in members CD, CB, BD and AE by method of joints.
21. A copper cylinder, 90 cm long, 40 cm external diameter and wall thickness 6mm had its both ends closed by rigid blank flames. It is initially full of oil at atmospheric pressure calculate the additional volume of all which must be pumped into it in order to rise the oil pressure to 5 N/mm2 above atmospheric pressure. For copper assume E = 1.0 x 106 N/mm2 and Poisson's ratio = 1/3. Take bulk modulus of oil is 2.6 x 108 N/mm2.

22. Find the forces in all the members of the girder shown in Fig. by the method of joints, indicating whether the force is compressive or tensile.
23. A cast iron thin cylindrical pipe of internal diameter 200 mm and 15mm thick is closely wounded by single layer steel wire of 2mm diameter under a tension of 50 N/mm2. Find the stresses set up in the pipe when the pipe is empty. Also find the stresses set up in the pipe and steel wire, when water is admitted in the pipe under a pressure of 5 N/mm2. Take E for as C.I and steel respectively 1 x 105 N/mm2 and 2x 105 N/mm2. Poisson's ratio = 0.3.
24. Derive an expression for the change in volume of a thin cylindrical shell subjected to internal fluid pressure.