SRI VIDYA COLLEGE OF ENGN& TECH
DEPARTMENT OF MECHANICAL ENGINEERING
QUESTION BANK
CE 6306 - STRENGTH OF MATERIALS

UNIT I

STRESS STRAIN DEFORMATION OF SOLIDS

PART- A (2 Marks)

1. What is Hooke's Law?
2. What are the Elastic Constants?
3. Define Poisson's Ratio.
4. Define: Resilience
5. Define proof resilience
6. Define modulus of resilience.
7. Define principal planes and principal stresses.
8. Define stress and strain.
9. Define Shear stress and Shear strain.
10. Define elastic limit.
11. Define volumetric strain.
12. Define tensile stress and compressive stress.
13. Define young's Modulus.
14. What is the use of Mohr's circle?
15. Define thermal stress.
16. Define Bulk modulus.
17. What is modulus of rigidity?
18. Define factor of safety.
19. State the relationship between young's modulus and modulus of rigidity..
20. What is compound bar?

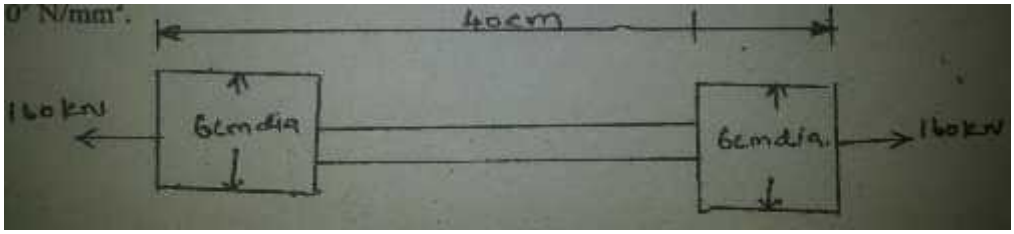
PART- B (16 Marks)

1. A Mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter 25 mm. The ends of the rod and tube are brazed together, and the composite bar is subjected to an axial pull of 40 kN. If E for steel and copper is 200 GN/m2 and 100 GN/m2 respectively, find the stresses developed in the rod and the tube also find the extension of the rod.

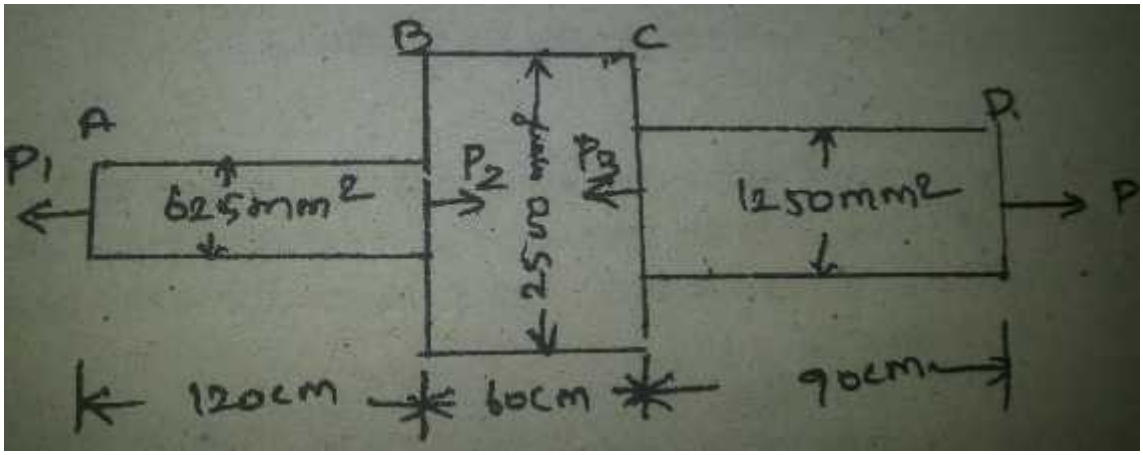
2. A cast iron flat 300 mm long and 30 mm (thickness) × 60 mm (width) uniform cross section, is acted upon by the following forces : 30 kN tensile in the direction of the length 360 kN compression in the direction of the width 240 kN tensile in the direction of the thickness. Calculate the direct strain, net strain in each direction and change in volume of the flat. Assume the modulus of elasticity and Poisson's ratio for cast iron as 140 kN/mm^2 and 0.25 respectively.

3. A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0039 mm. calculate the Poisson's ratio and the values of the three moduli.

4. The bar shown in fig. is subjected to a tensile load of 160 KN. If the stress in the middle portion is limited to 150 N/mm^2, determine the diameter of the middle portion. Find also the length of the middle portion if the total elongation of the bar is to be 0.2mm. young's modulus is given as equal to 2.1 x 10^5 N/mm^2.



5. A member ABCD is subjected to point loads P1, P2, P3, P4 as shown in fig. calculate the force P2 necessary for equilibrium, if P1 = 45 KN, P3 = 450 KN and P4 = 139 KN. Determine the total elongation of the member, assuming the modulus of elasticity to be 2.1 x 10^5 N/mm^2.



6. A steel rod of 20mm diameter passes centrally through a copper tube of 50mm external diameter and 40mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50˚C, calculate the stress developed in copper and steel. Take E for steel and copper as 200 GN/m^2 and 100 GN/m^2 and α for steel and copper as 12 x 10^{-6} per ˚C and 18 x 10^{-6} per ˚C.

7. Two vertical rods one of steel and the other of copper are each rigidly fixed at the top and 50cm apart. Diameters and lengths of each rod are 2cm and 4m respectively. A cross bar fixed to the rods at the lower ends carries a load of 5000 N such that the cross bar remains horizontal even after loading. Find the stress in each rod and the position of the load on the bar. Take E for steel = 2 x 10^5 N/mm^2 and E for copper = 1x 10^5 N/mm^2.

8. Drive the relationship between modulus of elasticity and modulus of rigidity. Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 30 mm and of length 1.5 m if the longitudinal strain in a bar during a tensile stress is four times the lateral strain. Find the change in volume, when the bar is subjected to a hydrostatic pressure of 10 N/mm2. Take E = 1X 10^5 N/mm^2 A) what are the different types of machining operations that can be performed on a lathe? And explain any six in detail.

9. (A). Find the young's modulus of a rod of diameter 30mm and of length 300mm which is subjected to a tensile load of 60 KN and the extension of the rod is equal to 0.4 mm.

(B). The ultimate stress for a hollow steel column which carries an axial load of 2MN is 500 N/mm^2 .If the external diameter of the column is 250mm, determine the internal diameter Take the factor of safety as 4.0

10. The extension in a rectangular steel bar of length 400mm and thickness 3mm is found be 0.21mm .The bar tapers uniformly in width from 20mm to 60mm E for the bar is $2x\ 10^5$ N/mm^2.Determine the axial load on the bar.

UNIT II

BEAMS – LOADS AND STRESSES

PART- A (2 Marks)

1. State the different types of supports.
2. What is cantilever beam?
3. Write the equation for the simple bending theory.
4. What do you mean by the point of contraflexure?
5. What is mean by positive or sagging BM?
6. Define shear force and bending moment.
7. What is Shear stress diagram?
8. What is Bending moment diagram?
9. What are the different types of loading?
10. Write the assumption in the theory of simple bending.
11. What are the types of beams?
12. When will bending moment is maximum.
13. Write down relations for maximum shear force and bending moment in case of a cantilever beam subjected to uniformly distributed load running over entire span.
14. Draw the shear force diagram for a cantilever beam of span 4 m and carrying a point load of 50 KN at mid span.
15. Sketch (a) the bending stress distribution (b) shear stress distribution for a beam of rectangular cross section.
16. A cantilever beam 3 m long carries a load of 20 KN at its free end. Calculate the shear force and bending moment at a section 2 m from the free end.
17. Derive the relation between the intensity of load and shear force, in bending theory.
18. A clockwise moment M is applied at the free end of a cantilever. Draw the SF and BM diagrams for the cantilever.
19. What is maximum bending moment in a simply supported beam of span 'L' subjected to UDL of 'w' over entire span?
20. What is mean by negative or hogging BM?

PART- B (16 Marks)

1. Three blanks of each 50 x200 mm timber are built up to a symmetrical I section for a beam. The maximum shear force over the beam is 4KN. Propose an alternate rectangular section of the same material so that the maximum shear stress developed is same in both