<u>Question Bank</u>

Subject Code: BTME-403-18
Subject Name: Strength of Materials-II

(Very short answer type questions)

1. Distinguish between thick and thin cylinders
2. What are thin cylinders?
3. What are hoop stresses for thin cylinders?
4. What are longitudinal stresses?
5. What are efficiencies of joints in thin cylinders?
6. Give formulas for hoop and longitudinal stresses in case of joint efficiencies.
7. Write formula of maximum shear stress at any point in a thin cylinder.
8. What are assumptions of solving the problems on thick cylinder shells?
9. What are stresses developed in a thick cylinder subjected to internal fluid pressure, comment on nature of stresses developed.
10. Define hoop stress for thick cylinders.
11. State any two assumptions made in Lame's theory.
12. Write formula of Lame's equation.
13. What is compounding of thick cylinders?
14. What are beams? How they are failing?
15. What do you mean by shear stresses in beams?
16. Sketch the distribution of shear stress across the depth of the beam of the following cross-sections:
    (a) Circular section (b) Rectangular section
17. Write the formula for calculating shear stress in a beam of any section.
18. Write the relation between average and maximum shear stress for the rectangular beam.
19. Write the relation between average and maximum shear stress for the circular beam.
20. Draw the shear stress distribution across the depth of beam:
    (a) T-section (b) I-section

(Short Answer Type Questions)

1. Derive expressions for calculation of hoop and longitudinal stresses in a thin cylinder subjected to internal pressure.
2. A cylindrical pipe of diameter 2 m. and thickness 2 cm. is subjected to an internal fluid pressure of 1.5 N/mm^2. Determine: (i) Longitudinal stress and (ii) Hoop stress.
3. A thin cylinder of diameter 2 m. contains a fluid at an internal pressure of 3 N/mm^2. Determine the maximum thickness of cylinder if (i) Longitudinal and circumferential stresses are not to exceed 30 N/mm^2 and 40 N/mm^2.

4. A boiler shell is to be made of 15 mm thick plate having tensile stress, circumferential stress and longitudinal stress of 120 N/mm^2. If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively, determine: (i) Maximum permissible diameter of the shell for an internal pressure of 2 N/mm^2, (ii) Permissible intensity of internal pressure when the shell diameter is 1.5 m.
5. A spherical vessel 1.5 m. diameter is subjected to an internal pressure of 2 N/mm^2. Find the thickness of plate required if maximum stress is not to exceed 150 N/mm^2 and joint efficiency is 75 %.
6. Derive formulae for calculation of hoop stress in a thick cylinder subjected to internal pressure.

   or

   Derive Lame's equation for thick cylinder.
7. Write the importance and applications of compound cylinders.
8. Determine the maximum and minimum hoop stress across the section of pipe of external and internal diameter of 600 mm and 440 mm respectively, when the pipe contains a fluid at a pressure of 8 N/mm^2.
9. The maximum shear stress in a beam of circular section of diameter 150 mm, is 5.28 N/mm^2. Find the shear force to which the beam is subjected.
10. A rectangular beam 100 mm wide is subjected to a maximum shear force of 100 kN, Find the depth of the beam if the maximum shear stress is 6 N/mm^2.

(Long Answer Type Questions)

1. A cylindrical shell is subjected to an internal fluid pressure, find an expression for change in diameter, change in length of the cylinder and volumetric strain.
2. Calculate change in diameter, change in length and change in volume of a thin cylindrical shell 100 cm diameter, 1 cm thick and 5 m long when subjected to an internal pressure of 3 N/mm^2. Take value of $E = 2 \times 10^5$ $N/mm^2$and Poisson ratio = 0.3.
3. Derive an expression for the stress induced , change in diameter and volumetric strain of a thin spherical shell of diameter 'd' and thickness 't', subjected to an internal pressure 'p'.
4. A thin spherical shell of internal diameter 1.5 m and of thickness 8 mm is subjected to an internal pressure of 1.5 N/mm^2. Determine the increase in diameter and increase in volume. Take value of $E = 2 \times 10^5$ $N/mm^2$and Poisson ratio = 0.3.
5. A thick walled closed-end cylinder is made of an aluminium alloy having E = 72 GPa and Poisson's ratio 0.33. The inside diameter of the cylinder is 200 mm and outside diameter is 800 mm. The cylinder is subjected to an internal fluid pressure of 150 MPa. Determine the principal stresses and maximum shear stress at a point on the inside surface of the cylinder. Also determine the increase in inside diameter due to fluid pressure.

6. A thick spherical shell of 400 mm internal diameter is subjected to an internal fluid pressure of 1.5 N/mm^2. If the permissible tensile stress in the shell material is 3 N/mm^2., find the necessary thickness of the shell.
7. Derive the general formula for distribution of shear stress in beams.
8. Show that for a rectangular section, the maximum shear stress is 1.5 times the average shear stress.
9. The shear force acting on a T- section beam is 100 kN whose dimensions are 200mm X 250 mm X 50 mm. the flange and web thickness are 50mm. Moment of inertia about horizontal neutral axis is 1.134×10^8 mm^4. Find the shear stress at Flange, junction of flange and web and at neutral axis. Also, draw shear stress distribution across the beam.
10. A beam of I-section is having overall depth as 500 mm and overall width as 900 mm. the thickness of flange and web is 25 mm respectively. If section carries a shear force of 40 kN, then calculate maximum shear stress. Also, draw shear stress distribution across the beam.