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DEPARTMENT OF MECHANICAL ENGINEERING

SUBJECT-SOM

Question bank- 3RD Semester

CHAPTER-1

SIMPLE STRESS AND STRAIN

1. List out the types of engineering material's & describe any two.

2. Explain any five mechanical properties of materials.

3. List out the types of loads & describe any two load`s with neat sketch's.

4. Explain different types of stresses with figures.

5. Explain different type of strains.

6. State Hook`s law.

7. Define young`s modulus.

8. What are the elastic constants & explain each of them?

9. Explain stress-strain diagram for ductile material indicating the salient points.

10. The following results were obtained from tensile test on a mild steel specimen , diameter of the specimen = 50mm,gauge length = 250mm length of specimen at failure = 300mm,extension at a load of 42.5KN = 444 10^{-4} mm, load at Yield point = 162.20KN, maximum load = 250KN, diameter of neck = 36mm, factor of safety = 3. Calculate,

- Young's modulus
- Stress of yield point
- Ultimate stress
- Working stress
- Percentage of elongation

CHAPTER-2

THIN CYLINDRICAL & SPHERICAL SHELL UNDER INTERNAL PRESSURE

1. Explain the thin shells.

2. Mention the five examples of thin shells.

3. Briefly explain the Hoop stress.

4. Briefly explain the longitudinal stress .

5. Derive an expression for longitudinal stress in thin cylinder subjected to internal pressure.

6. Derive an expression for HOOP stress of a thin cylindrical shell.

7. Define maximum shear stress.

8. Define the steps involved in design of thin cylindrical shell.

9. A cylindrical air drum is 1.8 m in diameter with plates 12mm thick .The efficiencies of the longitudinal & circumferential joints are respectively 75% and 40%, if the tensile stress in the plates is to be limited to 105N/mm^2 . Find the maximum safe area pressure.

10. A thin cylindrical shell 3m long is of 1m diameter . Determine the changes in length & diameter if the shell is subjected to an internal pressure of 20N/mm^2. Thickness of the plate is 15mm. Take E = 200KN/mm^2,1/m = 0.25.

11.A thin cylindrical shell of diameter 400mm & wall thickness 8mm has hemispherical ends .If there is no distortion of the junction under pressure determine the thickness of hemispherical ends.

E = 208GN/m^2

<u>CHAPTER-3</u>

TWO DIMENTIONAL STRESS SYSTEMS

1. Define principal stress.

2. Define principal plane.

3. The principal stresses in the wall of a container are $50MN/m^2$ and $100MN/m^2$. Determine the normal, shear, & resultant stresses in magnitude and direction in a plane, the normal of which makes an angle of 40^o with the direction of maximum principal stress.

4. A short metallic column of $600mm^2$ Cross - sectional area carries an axial compressive load of 120KN.For a plane inclined at 60^o with the direction of load, calculate.

-Normal stress

-Tangential stress

-Resultant stress

-Maximum shear stress & obliquity of the resultant stress.

5. Define Mohr's circle .

6. Write the equation of normal stress .

7. The tensile stress at a point across two mutually perpendicular planes are $100N/mm^2$ & $50N/mm^2$. Determine the normal , tangential & resultant stresses on a plane inclined at 30^o to the axis of the minor stress.

8. The stresses at a point in a bar are $220N/mm^2$ and $120N/mm^2$.Determine the resultant stress in magnitude & direction on a plane inclined at 60^o to the axis of the major stress .Also determine the maximum intensity of shear stress in the material at the point.

9. How will you find out graphically the resultant stress on a oblique section when the body is subjected to direct stresses in two mutually perpendicular directions.

<u>CHAPTER-4</u>

BENDING MOMENT AND SHEAR FORCE

1. List the different types of beams & sketch them.

2. Mention various types of supports & show reactions at each of the support.

3. State different types of loads on beams.

4. Define shear force and state its units.

5. Define bending moment & state its units.

6. A cantilever 2m long is subjected to a point load of 30 KN at its free end .Draw the SFD & BMD for the beam indicating their values at salient points in the beam.

7. A cantilever 2.5m long is subjected a UDL of 35KN/m on the whole span .Draw the SFD & BMD for the beam .Calculate SF & BM at a distance of 0.5m from fixed end & free end.

8. A cantilever 2m long is subjected to a UDL of 20KN/m on the whole span .Draw the SFD & BMD for the beam.

9. A simply supported beam of span 6m carries a UDL of 20 KN/m over its entire length in addition to a point load of 30KN at a distance of 4m from the left support .Calculate the magnitude and position of maximum bending moment & sketch SFD & BMD.

10. A beam of length 8m is supported at 1m from each end .It carries UDL of 2KN/m on the left overhang , 4KN/m on the supported length & 6KN/m on the right overhang .Draw SFD & BMD & state the position of contra flexure.

CHAPTER-5

THEORY OF SIMPLE BENDING

1. Define the following term

-Neutral axis

-Modulus of section

-Moment of resistance

2. Find the modulus of section of rectangular beam of size 230*420mm .

3. Find the modulus of section of circular beam of dia 320mm

4. Find the modulus of section of hollow rectangular beam of external dimensions of 300*450 & internal dimensions 200*320mm.

5. Write the basic assumptions in theory of simple bending.

6. Explain the concept of flexural stresses in the case of symmetrical & un symmetrical sections.

7. Derive the simple bending equation.

8. Find the moment of resistance of a square beam of side 250mm, if the permissible bending stress is 20mpa.

9. Find the moment of resistance of a rectangular beam of 250*500mm if the permissible bending stress is 18mpa.

10. Design a suitable rectangular beam over a span of 8m to carry UDL of 20KN/m , if b = d/2 & the bending stress not to exceed 18N/mm^2.

CHAPTER-6

COMBINED DIRECT AND BENDING STTESSES

1. Define column.

2. Define slenderness ratio.

3. What is meant by long column and short column.

4. Explain about failure of columns.

5. A rectangular column 200mm wide and 150mm thick is carrying a vertical load of 120KN at an eccentricity of 50mm in a plane bisecting the thickness. Determine the maximum and minimum intensities of stress in the section.

6. What is meant by eccentric loading? Explain its effects on a short column.

7. Derive the relation for the maximum and minimum stress intensities due to eccentric loading.

8. Define equivalent length.

CHAPTER-7

TORSION

1. Explain the terms shaft, axle and spindle?

2. What is flexible shaft.

3. What are the requirements of a shaft material.

4. What are the materials use in manufacture of shafts?

5. Prove that the shear stress induced in a shaft proportional to the radius.

6. A solid shaft is to transmit a torque of 20kNm. If the maximum shear stress induced in the shaft is not to exceed 100N/mm^2. Find the minimum diameter of the shaft.

7. Find the diameter of solid shaft to transmit 90kw power at 300RPM. If the maximum torque is 30% greater than the mean torque and the allowable shear stress is 65N/mm^2.

8. A hollow shaft is required to transmit 400kW at 240rpm. The maximum torque is 20% greater than the mean. The permissible shear stress 60N/mm^2. The twist in a length of 4m is not to exceed 15^o. The ratio between inner and outer diameter is 2/3. Calculate inner and outer diameters of the shaft. Take G=80kN/mm^2.

9. A solid circular shaft of diameter 50mm and 2m long. Determine the angle of twist when the shaft is subjected to a torque of 85N-m. Take G=0.8*10^{5}N/mm^2.

10. A solid shaft is to transmit 400kW runs at 120rpm. If the maximum stress induced most not exceed 90N/mm^2. Find the diameter of the shaft.