Question Bank

STRUCTURAL MECHANICS (Th-1)

FOR DIPLOMA IN CIVIL ENGINEERING

3rd SEMESTER AS PER SCTE&VT SYLLABUS

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STRUCTURAL MECHANICS

Chapter-1

2 mark Question

1. Define about Free body diagram.
2. Define about moment of inertia.
3. Write down conditions for equilibrium.

10 mark Question

1. Find the moment of inertia of a T-section with flange as 150mm x 50mm about x-x and y-y axis through the center of gravity of the section.

Chapter-2.1

2Marks Question

1.Define Poisson's ratio.

2.Define Hooke's law.

3.Define Young's modulus of elasticity.

4.Define modulus of Rigidity.

5.What do you mean by volumetric strain?

6.Define Bulk's modulus of elasticity.

7.Elaborate about Toughness ,Stiffness ,Ductility ,malleability ,creep & Tenasity.

10 marks Questions

1. Write down the relationship between E,C&K?
2. Derive the relationship between E,G & k?

3. Draw the neat sketch of stress strain diagram for mild steel and explain the salient points.

CHAPTER-2.2

2 marks Question

1. Define Ultimate stress.
2. Define breaking stress.
3. Elaborate about Percentage of elongation.

10 marks Question

1. A brass bar having cross-sectional area of 1000mm^2 is subjected to an axial force as shown below. Find the change in length of the bar. Take E=1.05x10^5 N/mm^2.
2. A steel bar of cross section 500 mm^2 is acted upon by the forces as shown in figure . Determine the total elongation of the bar. Consider E=2x10^5N/mm^2.
3. A circular steel bar is subjected to a loading as shown in the figure. If the Modulus of Elasticity is 100GPa. Then what is the total elongation?

Chapter-2.3

2 marks Question

1. Define principal stress and principal plane.
2. Elaborate about Mohr's circle.

10 marks Question

1. An element in a strained body is subjected to tensile stresses of 200 MPa in horizontal direction and 150 MPa in vertical direction. Each of the above stresses is

accompanied by a shear stresses of 30 MPa. Such that when associated with the minor tensile stresses of 30 MPa , such that when associated with the minor tensile stresses tends to rotate the element in clock wise directions. Find

(i)Magnitude of normal and shear stress on a section inclined at an angle 30degree with major tensile stress.

(ii) principal stress and their direction

(iii) Maximum Shear stress and its direction.

2. The principal stresses at a point across two perpendicular planes are 75 N/mm^2 (tensile) and 35 N/mm^2 (tensile). Find the normal , tangential stresses and the resultant stress and its obliquity on a plane at 20 degree with major principal plane.

Chapter-3.1

2 marks Question

1. Define pure bending.
2. Define Section modulus.

10 marks Question

1. Write down about assumption in the theory of pure bending?(5/10)

Chapter-3.3

2 marks Question

1. Define about pure Torsion.

10 mark Question

1. Write down about theory of pure torsion?

2. A solid shaft of 200 mm diameter has the same cross sectional area as that of a hollow shaft of the same material with the inside diameter 150mm. Find the ratio of power transmitted by the two shafts at the same speed?

Chapter-3.4

2 marks Question

1. Elaborate about Direct stress & Combined stress.
2. Write down the condition for No Tension?
3. Define Limit of Eccentricity.
4. Write down the Core of Kernel of circular Section?
5. Write down the middle one third rule of rectangular section?

10 marks Question

1. A rectangular beam 100mm wide and 200mm deep is simply supported over a span of 5m. If the beam is subjected to a central point load 20KN. Find the maximum bending stress and shear stress induced in the beam?

Chapter-3.2

10mark Question

1.A beam of rectangular cross-section in 300 mm wide and 500 mm deep. If the section is subjected to a maximum shear force of 50KN. Find the maximum shear stress and draw the shear stress distribution along the depth of the beam?

Chapter-4

2 marks Question

1. Write down Euler's column Theory?
2. Define long and short column?

5 marks Question

1.A steel rod is 5m and 50 mm diameter is used as a column with one end fix and other end free. Determine the crippling load by Euler's formula. Take E as 200GPa.

2. A steel rod 4m long and 30 mm diameter is used as a column with both end fixed. Determine the Crippling load by Euler's formula. Take E as $2x10^5 N/mm^2$.

Chapter-5

2 mark Question

1. Write down the value of maximum B.M. in case of a simply supported beam of length L carrying a point load of W at its center.
2. What is point of contraflexure?
3. Write down the value of maximum B.M. in case of simply supported beam of length L carrying a point load of W at its center?
4. Define free body diagram.

5 mark Question

1. Draw the shear force and bending moment diagram of a cantilever beam of length L carrying a concentrated load W at the free end?

2. A fixed beam of span 8m is subjected two point load of 30KN and 40KN at a distance of 3m and 6m from A. Calculate the fixing moment at A & B.

10 mark Question

1. A beam AB 10 meters long has supports at its ends A and B. It carries a point load of 5KN at 3meters from A and a point load of 5KN at 7meters from A and a uniformly distributed load of 1KN per meter between the point loads . Draw SF and BM diagrams for the beam.
2. A cantilever beam of length 5m carries two point loads of 4KN and 6KN acting at free end and 2m from the free end respectively. It also carries an UDL of 2 KN/m between two point loads. Draw BMD and SFD.

Chapter-6

2 mark Question

1. Write down the equation for the maximum deflection of a simply supported beam of span L with a central point load W?

5 mark Question

1. Derive the slope and deflection of a cantilever beam with a point load at its free end by double integration method.
2. A simply supported beam of span 4m is carrying a uniformly distributed load of 2KN/m over the entire

span. Find the maximum slope and deflection of the beam. Take EI for the beam as 80 X 10^9 N-mm^2.

3. A wooden beam 140mm wide and 240mm deep has a span of 4m. Determine the load, that can be placed at it's center to cause the beam a deflection of 10mm. Take E as 6GPa.

10 mark Question

1. A Simply supported beam 6m long is supported at A & B. Two point loads 15KN and 10KN is placed at a distance 2m and 4m from end A. using Macauly's method find the slope at A and deflection at c. Take EI as constant.

Chapter-8

2 mark Question

1. Differentiate between statically determinate and statically indeterminate structure.
2. Define degree of indeterminacy.

10 mark Question

1.Find out forces in all the members with their nature as tensile or compressive as shown in figure using method of joints.

2. A steel girder consisting of 7 members each of 3m length is freely supported at its end points. The girder is loaded at B & C . Find the forces in all the members of the girder indicating whether the force is compressive or tensile.