Module I (Simple Stress & Strain)

Q1 State Hooke's law. [2 M]

Q2 What is the difference between stress and strain? [2 M]

Q3 Draw stress – strain diagram for ductile and brittle materials with complete information. [2 M]

Q4 Explain thermal stress and strain? Also write the factors affecting thermal stress and strain. [2 M]

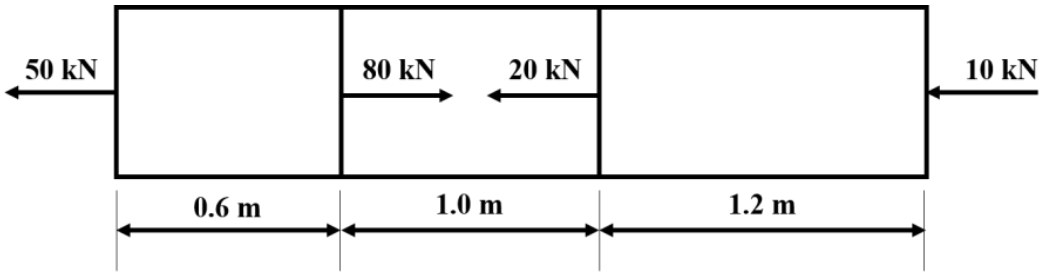
Q5 What do you mean by impact load? [2 M]

Q6 What do you understand by statically indeterminate problem? Illustrate with an example. [2 M]

Q7 Find a suitable relationship between elastic constants E and G, where symbols have their usual meaning. [5 M]

Q8 A metallic rod of 500 length and 50 mm diameter, when subjected to a tensile force of 100kN at the ends, experiences an increase in its length by 0.5 mm and a reduction in its diameter by 0.015mm. Determine the Poisson's ratio of the material? [5 M]

Q9 A brass bar having a cross-sectional area of 1000 mm^2 is subjected to axial forces as shown in figure. Find the total change in length of the bar. Take E_{brass} = 105 GN/m^2 [10 M]



Module II (Thin cylinder and spherical shell under internal pressure)

Q10 Describe hoop stress and longitudinal stress. [2 M]

Q11 A cylindrical shell 3 m long which is closed at its ends has an internal diameter of 1 m and a wall thickness of 15 mm. Calculate the circumferential and longitudinal stresses induced and also change in dimensions of the shell if it is subjected to an internal pressure of 1.5 MN/m^2. [5 M]

Q12 Derive the expression for Hoop stress and Longitudinal stress for a thin cylinder. [10 M]

Q13 Derive the expression for Hoop stress and Longitudinal stress for a thin sphere. [10 M]

Module III (Two-dimensional stress systems)

Q14 Define Principal plane and principal stress. [2 M]

Q15 Explain sagging and hogging of beam with clear sketch. [2 M]

Q16 What do you understand by point of inflection and point of contraflexure? Explain with neat sketches. [2 M]

Q17 Explain the significance of Mohr's circle. [2 M]

Q18 The principal tensile stresses at a point across two perpendicular planes are 100 MPa and 50 MPa. Find the normal and tangential stresses and the resultant stress and its obliquity on a plane at 20^0 with the major principal plane. [5 M]

Q19 At a point in a loaded component the state of stress is given by σ_x = 270 MPa, σ_y = 130 MPa and $\tau_{xy} = \pm$ 40 MPa

Determine the following using Mohr's circle

(i) the maximum and minimum principal stresses and the planes on which they act, and

(ii) the maximum shearing stress in magnitude and direction. [10 M]

Module IV (Bending moment& shear force)

Q20 What do you mean by pure bending? [2 M]

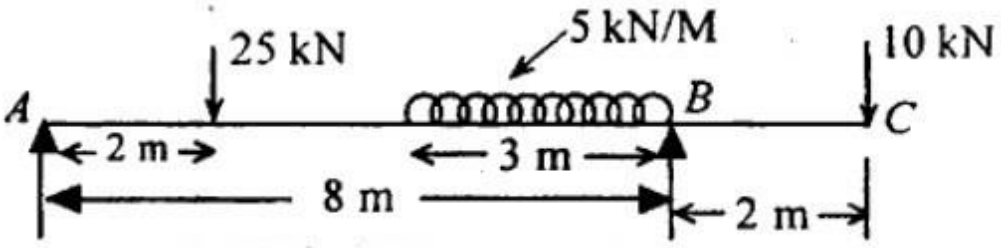
Write short notes on sectional modulus. [2 M]

Q21 Explain different types of Supports, Beam, and Loading [5 M]

Q22 Draw the shear force and bending moment diagram for a cantilever of length L and loaded with a uniformly distributed load of intensity w for the entire span. [5 M]

Q23 Draw shear force diagram for a simply supported beam carrying a uniformly distributed load (w per unit length). [10 M]

Q24 A loaded beam is as shown below. Draw its S.F and B.M diagram [10 M]



Module V (Theory of simple bending)

Q25 Define section modulus. [2 M]

Q26 What assumptions are made in theory of simple bending? [5 M]

Q27 Derive the equation of pure bending and state the assumption made for deriving the equation. [10 M]

Q28 A rectangular beam 200mm deep and 300mm wide is simply supported over the span of 8m. What uniformly distributed load per metre the beam may carry, if the bending stress is not to exceed 120N/mm^2. [10 M]

Q29 A cantilever beam of length 2m fails when a load of 2KN is applied at the free end. If the section is 40 mm x 60 mm, find the bending stress at the failure. [10 M]

Module VI (Combined direct & bending stresses)

Q30 What do you mean by slenderness ratio? [2 M]

Q31 What do you understand by effective length of a column? [2 M]

Q32 What is meant by eccentric loading? Explain its effects on a column. [5 M]

Q33 Calculate the safe compressive load on a hollow cast iron column (One end rigidly fixed and the other hinged) of 150 mm external diameter, 100 mm internal diameter and 10 m length. Use Euler's formula and value of E = 95 GN/m^2. [10 M]

Q34 Write the expressions for the effective length of column's with different support conditions. [10 M]

Module VII (Torsion)

Q35 What do you mean by polar moment of inertia? [2 M]

Q36 Explain torsional rigidity. [2 M]

Q37 State the assumptions made for derivation of torsional equation. [5 M]

Q38 Compare the resistance to torsion of a hollow circular shaft to that of solid shaft if the inside diameter of the hollow shaft is two third of the external diameter and the two shafts have the same material and weight and of equal length. [5 M]

Q39 A shaft has to transmit a torque of 40 kN/m. The maximum shear stress is not to exceed 110 MPa and the angle of twist is not to exceed 1 degree per meter length. Take G = 80 GPa. Determine the shaft diameter if it is a solid circular shaft. [10 M]

Q40 A solid shaft transmits 100 kW at 60 rpm. Determine the diameter of the shaft if the shear stress is not to exceed 75MPa. If the shaft is replaced by a hollow shaft whose internal diameter is 0.6 times external diameter, while length, material and the maximum shear stress are the same, find the percentage saving in weight. [10 M]

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