Code No. PC302CE

METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY (An Autonomous Institution)

B.E. (CIVIL) III-Semester (AICTE) (Regular) Examination, Feb -2023

Subject: **SOLID MECHANICS**

Time: 3 hours Max.Marks:60

Note: Missing data, if any, maybe suitably assumed.

PART-A

Answer All the questions.

Q.No. Questions Marks

1. (a) Define Bulk modulus and Poisson’s ratio. (2)

(b) Calculate the elongation of a uniformly tapering circular bar 3m long with end diameters

60 mm and 40 mm, subjected to an axial tensile load of 80 KN. Take E=200KN/mm2 (2)

(c) Draw bending moment diagram for a cantilever beam of span ‘l’ and subjected to a

clockwise couple ‘M’ at its free end. (2)

(d) Calculate the section modulus of a solid circular section of diameter 100mm. (2)

(e) Give the relation between maximum and average shear stress for a rectangular and circular

section. (2)

(f) Explain core of a section. Draw the core of a rectangular section. (2)

(g) Sketch the radial pressure and hoop stress distribution across the section of a thin cylinder

due to internal pressure of fluid. (2)

(h) A point in a strained material is subjected to a direct stress of 100 N/mm2 (tensile). Find

the normal and tangential stress on a plane making 30ᵒ with the axis of stress. (2)

(i) Find torsional rigidity of a solid circular shaft of 80mm diameter. C=100 GN/m2 (2)

(j) Define section modulus (Z) (2)

PART- B

Answer any five questions

2.(a) Draw stress strain diagram for mild steel and explain the salient points in it. (3)

(b) Acircular bar of 24mm diameter and 800 mm long is subjected to an axial load of 45 KN.

The elongation of bar is 0.328mm and the change in diameter is observed to be 0.003mm.

Calculate (i) Modulus of Elasticity (ii) Poisson’s ratio (iii) Bulk Modulus (5)

3. Draw shear force and bending moment diagrams for a simply supported beam of span 8m and

subjected to a uniformly load of 10 KN/m over the entire span and also two point loads of

60KN and 40KN at 2m from left and right support respectively. (8)

4. Derive Bending formula for a beam subjected to pure bending and state the assumptions made

in it. (8)

5(a) State middle third rule for a rectangular section. (3)

(b) A hollow circular column of 120mm external diameter and 90mm internal diameter is

subjected to an axial load of 100 kN and an eccentric load of 90 kN at an eccentricity of

80mm from the axis of column. Calculate the maximum and minimum stress intensities at

the base of column section. (5)

6(a) A beam of triangular section having 120mm base and height 180mm is subjected to a shear

force of 90 KN across a section. Calculate the maximum shear stress and also at neutral

axis. (3)

(b) Sketch the shear stress distribution across the T- section whose flange is 120mm x10mm and

the web is 180mm x10mm when subjected to a shear force of 200KN. (5)

7(a) Derive an expression for the circumferential stress in a thin cylinder due to internal

pressure. (3)

(b) A thin cylinder of 800mm internal diameter and 1.2m long is subjected to an internal pressure

of 6N/mm2. If the permissible tensile stress in cylinder is 160N/mm2, Calculate the increase

in volume of cylinder. E=200 KN/mm2 and ν=0.3 (5)

8(a) Write pure torsion equation and Explain it's terms (3)

(b)A solid circular shaft 2m long transmits 150KW at 120 RPM. If the maximum torque exceeds

the mean by 30% and the shear stress is limited to 60N/mm2, Calculate the diameter of shaft

and also the angle of twist. C=100 GN/m2 (5)

9(a) A point in a strained material is subjected to direct stresses of 120 MPa (tensile) and 80 MPa

(compressive) and also accompanied by a simple shear stress. If the maximum principal

stress is 140 MPa, Calculate the magnitude of shear stress and minor Principal stress. (4)

(b) Determine the external diameter of a thick cylinder of internal diameter120mm to withstand a

pressure of 40 N/mm2, if the permissible stress is 130 N/mm2. (4)

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