Code No. PC302CE

METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY  (An Autonomous Institution)

 B.E. (CIVIL) III-Semester (AICTE) (Supplementary )Examination, August -2023

 Subject: **SOLID MECHANICS**

Time: 3 hours Max.Marks:60

 Note: Missing data, if any, may be suitably assumed.

 PART- A

 Answer all questions .

Q.No. Questions Marks

1. (a) List out any two assumptions made in the theory of pure bending. (2)

(b) What do you mean by core of a section. Sketch the core of a circular section. (2)

(c) Write torsion equation and explain it's terms (2)

(d)The Young’s modulus and Poisson’s ratio for a material are 200 GPa and 0.32

 respectively. Calculate its Rigidity modulus. (2)

(e) Differentiate between ductility and brittleness. (2)

(f) Draw bending moment diagram for a cantilever beam of span 3m and subjected to a

 uniformly distributed load of 6KN/m over the entire span. (2)

(g) A beam of rectangular section 100mm wide and 180mm deep is subjected to a shear force

 of 90 KN across the section. Calculate the maximum shear stress and sketch the shear

 stress distribution across the section. (2)

(h) A solid circular shaft of 100mm diameter is subjected to a bending moment of 8KN-m and

 a twisting moment of 6KN-m. Find the maximum shear stress developed in the shaft (2)

(i) Construct Mohr’s circle for a body subjected to a pure shear of 40 N/mm2. (2)

(j) Write Lame’s equations for the radial pressure and hoop stress distribution across the

 thickness of a thick cylinder and explain the parameters in it. (2)

 PART- B

 Answer any five questions

2(a) Define Modulus of Rigidity and Bulk Modulus. What is the relation between three Elastic

 Moduli E,C and K. (3)

(b) A steel rod of 20mm diameter passes through a copper tube of 36mm external and 24mm

 internal diameter. The rod and tube are screwed together at ends at a temperature of 50οC.

 Calculate the stresses in rod and tube when the temperature of the assembly is raised to 150οC.

 Es=200 GN/m2, Ec=100 GN/m2, αs=12x10-6 /ο C and αc=18x10-6 /ο C (5)

3. A simply supported beam 10 m long is subjected to a uniformly distributed load of 10 kN/m

over a length of 6m from left support and a point load of 80 kN acting at 2m from right support. Draw shear force and bending moment diagrams. (8)

4. Sketch the shear stress distribution across an I-section whose flanges are 120mmx10mm each

 and the web is 150mm deep with 10mm thickness, subjected to a Shear force of 240kN. (8)

5(a) Explain Principal planes and Principal stresses. (3)

 (b) A point in a strained material is subjected to direct stress of 120 N/mm2 and 80 N/mm2 both

 tensile in two mutually perpendicular directions. It is also accompanied by a simple shear

 stress of 20 N/mm2. Calculate (i) Principal stresses (ii) Normal and tangential stresses on a

 plane making 30ο with the axis of smaller stress. (5)

6.(a) Derive expressions for the change in diameter and length of a thin cylinder due to internal

 pressure. (4)

(b) Find the thickness of a thick cylinder of internal diameter 120mm to withstand a pressure of

 20 N/mm2, if the permissible stress is 100 N/mm2. (4)

7. A hollow circular shaft is to transmit 200KW at 150 RPM. The maximum shear stress in the

 shaft is 70 N/mm2 and the maximum torque in each revolution exceeds the mean by 25%.

 Calculate the internal and external diameters of the shaft if diameter ratio is 3/5.Also, find the

 angle of twist in a length of 2.4m. C=100 GN/m2 (8)

8(a) Derive equation of pure bending (8)

9(a) A simply supported beam 6m long of rectangular section is 200mm wide and 300mm deep.

 It is subjected to two point loads of 30 KN each acting at 2m from each support. Determine

 the maximum bending stress across a section at mid span and sketch the bending stress (4)

(b) A hollow circular column of 100mm internal and 120mm external diameter is subjected to an

 axial load of 200KN and an eccentric load of 120KN at an eccentricity. Find the greatest

 eccentricity of 120KN load to just avoid tension at the base of column. (4)

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