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Total No. of Questions : 09

B.Tech.(CE) (2018 Batch)/(Electronics & Communication Engg.)

(Sem.–3)

SOLID MECHANICS

Subject Code : BTCE-302-18

M.Code : 76371

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) What is Hooke's Law?

b) Compare between solid and hollow shafts.

c) Define the term equivalent length. Discuss its uses.

d) What do you understand by pure bending?

e) Describe the effect of couple on SF and BM diagrams of a beam.

f) What are the various types of loads to which beams are subjected to?

g) Define Modulus of Elasticity.

h) Define the term equivalent length. Discuss its uses.

i) Define Polar modulus of the shaft section.

j) What do you mean by Anticlastic bending?

SECTION-B

2. A compound tube is made by shrinking a thin steel tube on a thin brass tube. As and Ab are the cross sectional areas of steel and brass tubes and Es and Eb are the corresponding values of Young's Modulus. Show that for any tensile load the extension of the compound tube is equal to that of a single tube of the same length and total cross sectional area, but having a Young's Modulus of (EsAs+EbAb)/(As+Ab)

3. A simply supported beam of rectangular section is 200 mm wide and 300 mm deep. It supports a uniformly distributed load of 6kN/m over an effective span of 4m. Calculate the magnitude and direction of the principal stresses at a point located 0.50m from the left support and 50mm above the neutral axis.

4. Compare the section moduli of two beams of the same weight and length if the first beam is a solid circular beam of diameter d and the second is a circular tube of outer diameter D_1 and inner diameter.

5. A round steel rod of diameter 15mm and length 2m is subjected to a gradually increasing axial compressive load. Using Euler's formula find the buckling load. Find also the maximum lateral deflection corresponding to the buckling condition. Both ends of the rod may be taken as hinged. Take E = 2.1 × 10^5 N/mm^2 and the yield stress of steel = 250 N/mm^2.

6. A cylinder 250mm in diameter has a wall thickness of 5mm and is full of a fluid at atmospheric pressure. Its ends are closed by rigid plates and an axial compressive force of 80 kN is applied to the cylinder so that the pressure of the fluid rises by 90 kPa. Calculate the bulk modulus of the fluid. Take the cylinder material E = 200kN/mm^2 and l/m = 0.25.

SECTION-C

7. A horizontal beam 10 m long carries a uniformly distributed load of 180 N/m and in addition a concentrated load of 200 N at the left end. The beam is supported at two points 7 m apart, so chosen that each support carries half the total load. Draw shear force and bending moment diagrams for the beam.

8. A horizontal girder of steel having uniform section is 14m long and is simply supported at its ends. It carries concentrated loads of 120 kN and 80 kN at two points 3m and 4.5m from the two ends respectively. I for the section of the girder is 16 × 10^8 mm^4 and Es =210 kN/mm^2. Calculate the deflections of the girder at points under the two loads. Find also the maximum deflection. Use Macaula's method.

9. Derive the torsion equation and state various assumptions made in the theory of pure torsion.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.