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Total No. of Pages : 02

Total No. of Questions : 18

B.Tech.(CE) (2018 Batch) (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

Write briefly :

1. Explain various types of beams.
2. What are the various types of stresses? Explain.
3. What are the various assumptions made in the Euler's theory
4. Give classification of materials
5. Explain the terms 'Torsional Rigidity'.
6. What are the limitations of Euler's formula?
7. Define polar modulus of the shaft section.
8. Define the term equivalent length. Discuss its uses.
9. Define columns, Post and struts.
10. What is point of contraflexure?

SECTION-B

11. A load of 300 kN is applied on a short concrete column 250 mm × 250 mm. The column is reinforced by steel bars of total area 5600 mm^2. If the modulus of elasticity for steel is 15 times that of concrete, find the stress in steel and concrete. If the stress in concrete should not exceed 4 N/mm^2, find the area of steel required so that the column may support a load of 600 kN.

12. Two planes AB and BC which are at right angles carry shear stresses of intensity 17.5 N/mm^2 while these planes also carry a tensile stress of 70 N/mm^2 and a compressive stress of 35 N/mm^2. Determine principal planes and principal stresses. Also determine the maximum shear stress and the planes on which it acts.

13. A cast iron test beam 20 mm × 20 mm in section and 1m long and supported at the ends fails when a central load of 640 N is applied. What uniformly distributed load will break a cantilever of the same material 50 mm wide, 100 mm deep and 2m long?

14. A square column of wood is 2.5 m long with pinned ends. Taking a factor of safety of 2.5 in computing Euler's critical load and also taking the allowable compressive stress as 12 N/mm^2, find the size of the cross section, if the column has to safely support (i) 150 kN (ii) 275 kN. Take E=1.3 × 10^{4}N/mm^2.

15. A thin walled spherical vessel having a diameter of 1.50m is made of steel plates of uniform thickness. It is filled with water which is pumped in untill the pressure is 1.75 N/mm^2. After the pumping has been completed, a relief valve fitted to the vessel is opened and water is allowed to escape until the pressure falls to atmospheric. If the volume of water which escapes is 3500 cc, determine the thickness of the plates.

SECTION-C

16. A beam of length L carries a uniformly distributed load of w per unit run on its whole length. It has one support at its left end and the other support is at a distance 'a' from the other end. Find the value of 'a' so that the maximum bending moment for the beam is as small as possible. Find also the maximum bending moment for this condition.

17. A beam of length L simply supported at the ends carries a point load W at a distance 'a' from the left end. Find the deflection under the load and the maximum deflection. Use Macaulay's method.

18. 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.