Roll No. | | | | | | | | | | | | | 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. A simply supported beam AB of span 5m is subjected to a load of 50 kN at 2m from A. Calculate reaction at B.
2. A material has a Young's Modulus of 2×10^5 N/mm^2 and Poisson Ratio of 0.25. Calculate Bulk Modulus.
3. Show Mohr circle for a case when principal stresses are equal in magnitude. Major Principal Stress is compressive and minor principal stress is tensile in nature.
4. Write the expression for maximum deflection of a simply supported beam of span l carrying a concentrated load W at the centre of the beam.
5. Show the shear stress distribution for a typical rectangular section.
6. What is the limitation of Euler's formula for calculating the crippling load on the columns?
7. A hollow circular shaft (outer diameter = 1.5 times the inner diameter) is subjected to a bending moment M and torque T. What is the ratio of maximum bending stress to maximum shear stress in the shaft?
8. Write an expression for hoop stress in a thin cylinder closed at both ends and subjected to inner fluid pressure. Indicate what the various notations stand for?
9. Define strain and give its various types.
10. Differentiate between short and long column.

SECTION-B

11. A steel bar of 50mm × 50mm in section and 150 mm length is subjected to tensile load of 300 kN along the longitudinal axis and tensile load of 500 kN and compressive load of 400 kN on the lateral faces. Determine the change in dimension of bar and the change in volume. Adopt $E_s = 2 \times 10^5 N/mm^2$ and $\mu = 0.3$.

12. At a certain point in a strained material, the intensities of normal stresses on two lanes at right angle to each other are $20N/mm^2$ and $10\ N/mm^2$, both tensile in nature. They are accompanied by shear stresses of $10N/mm^2$. Find principal stresses and shear stress. Also indicate the position of principal planes.

13. A beam 200 mm deep of symmetrical section has $I = 8 \times 10^7\ mm^4$ and is simply supported over a span of 8m. Calculate (i) the UDL it may carry (ii) the concentrated load it may carry at the centre if maximum bending stress is not to exceed $100\ N/mm^2$.

14. A gas is to be contained under a pressure of 20MPa. in a spherical vessel and its compressed volume will be $2 \times 10^9\ mm^3$. Determine the diameter of the spherical vessel when it is empty. Take allowable stress = 150 MPa, $E = 2 \times 10^5$ MPa and Poisson's ratio = 0.3.

15. A hollow shaft having an inside diameter 60% of its outer diameter is to replace a solid shaft transmitting the same power at the same speed. Calculate the percentage saving of material. The material to be used is same in solid as well as hollow shaft.

SECTION-C

16. A simply supported beam ABC with supports at A and B, 6m apart and with an overhang BC 2m carries a uniformly distributed load of 15kN/m over the whole length (8m). Draw SFD & BMD for the beam. Locate point of contra flexure, if any. Also compute point of zero shear force.

17. Illustrate the use of Macaulay's method with the help of examples.

18. Derive an expression for crippling load for a long column when both ends of the column are hinged.

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.