

18C73

B. Tech. EXAMINATION, 2021

(Third Semester)

(C Scheme) (Main Only)

(CE)

CE201C

STRENGTH OF MATERIALS

Time : 2½ Hours]

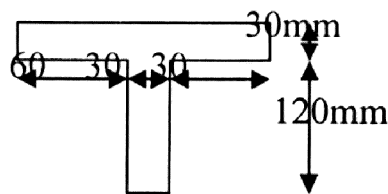
[Maximum Marks : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

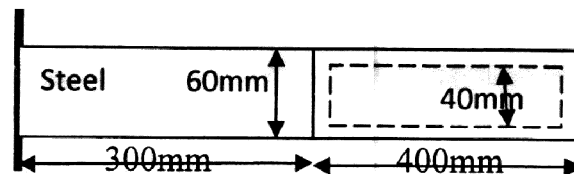
Note : Attempt *Four* questions in all. All questions carry equal marks. Any data if missing can be suitably assumed. Use of scientific calculator is allowed.

1. (a) Derive the relationship among E (Young's modulus), G (Modulus of rigidity) and K (Bulk modulus).
(b) A brass plate of uniform thickness 5 mm is 600 mm long and varies in width from 70 mm at one end to 30 mm at the other. Find the load required to be applied axially to this plate to cause an extension of 1 mm. Young's modulus is 100 GPa.
2. (a) A cube is subjected to biaxial state of stress 50 MPa (T) and 75 MPa (Comp). Find the maximum shear stress and magnitude of normal stress on the plane carrying maximum shear stress.

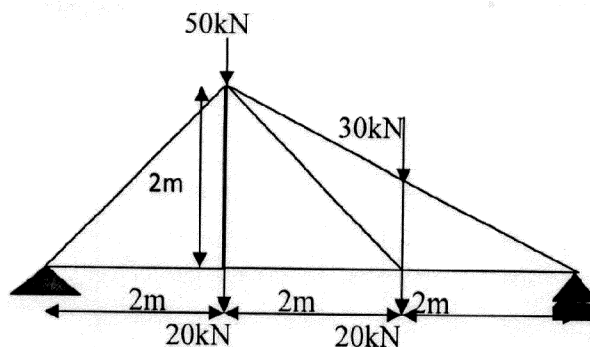
- (b) A simply supported beam with 10 m effective span carries a uniformly distributed load 10 kN/m on left half and 20 kN/m on the remaining length. Find the maximum shear force and bending moment. Also draw shear force and bending moment diagrams.
3. (a) A cantilever beam of span 'L' with uniform flexural rigidity throughout carries udl of intensity 'w' per unit length. Show that possible shapes of beam of uniform strength.
- (b) Find the moment carrying capacity of the following section, if the permissible stresses under tension/compression are 80 MPa :



4. (a) Show the shear stress variation for a beam made of the following sections :
- T section
 - I section
 - Circular section
- (b) A cantilever beam of span 'L' carries two point loads each 'P' at mid span and free end. Find the slope and deflection at the free end.
5. (a) Discuss the assumptions and limitations of elastic torsional formula.
- (b) Find the stresses in two materials and angle of twist if modulus of rigidity for steel is 85 GPa and Aluminium is 30 GPa.



6. (a) What is the minimum length upto which Euler's formula is applicable for a column made of a material of proportional limit 300 MPa and the diameter of column 20 mm ?
- (b) A rod 30 mm diameter and 2.5 m long has a deflection of 5 mm as a simply supported beam with a central load 100N. If it is used as a strut with both ends hinged, find the safe load on the rod with factor of safety 3.
7. (a) Discuss the significance of theories of failures.
- (b) A thin spherical shell has a diameter of 1.2 m and is subjected to an internal pressure of 2.5 MPa. Determine the minimum thickness required if the stress is not to exceed 40 MPa. Find the increase in the diameter of the sphere and the change in volume. Young's modulus 200 GPa and Poisson's coefficient 0.3.
8. (a) Discuss the advantages and disadvantages of the following theories of failures :
- (i) Maximum shear stress
- (ii) Total strain energy
- (b) Analyze the truss shown in figure :



9. (a) Differentiate between elasticity and plasticity.
- (b) A cube is subjected to pure shear stress. Draw Mohr circle to determine the normal and shear stress over an inclined plane.

- (c) A simply supported beam carries udl throughout the span with equal overhangs at both ends. Show point of inflexions.
- (d) Explain beam of uniform strength.
- (e) Explain effective length of column with the help of figure.
- (f) What are the hoop stress and longitudinal stress ?
- (g) What is Secant's formula ? Detail all the terms.