

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (CE) (2012 to 2017) (Sem.-3)

STRENGTH OF MATERIALS

Subject Code : BTCE-303

M.Code : 56074

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. Answer briefly :

- a. What is hoop stress?
- b. Explain necking phenomenon and permanent set formation.
- c. A bar 40mm in diameter is subjected to an axial load of 40 kN. The extension of the bar over a gauge length of 200mm is 0.3mm. The decrease in diameter is 0.018mm. Find the Poisson's ratio.
- d. If $\sigma_x = 10$ MPa, $\sigma_y = -10$ MPa and $\lambda_{xy} = 0$, then what is the center and radius of the Mohr's circle?
- e. What is neutral axis and neutral plane?
- f. State the main assumption while deriving the general formula for bending stress.
- g. Plot the shear stress v/s shear strain curves for brittle and ductile materials.
- h. How are the Young's modulus of elasticity and modulus of rigidity related?
- i. Briefly explain 'Polar Moment of Inertia' and where is it used?
- j. What is a column? Differentiate it from strut.

SECTION-B

2. A piece of material is subjected to three perpendicular tensile stresses. The strains in these directions are in the ratio of 3: 4: 5. If the poisson's ratio is 0.286, find the ratio of the stresses and their values if the greatest stress is 60N/mm^2 .
3. A beam 5m long and simply supported at each end, uniformly distributed load of 1000N/m extending from the left end to a point 2m away. There is also a clockwise couple of 1500N-m applied at the center of the beam. Draw the shear force and bending moment diagrams for the beam and find maximum bending moment. Neglect the weight of the beam.
4. A simply supported beam of span 3.6m has to resist a shear force of 120KN . The cross section of the beam is a T- section with flange width of 120mm , web and flange thicknesses of 16mm each and overall depth of 160mm . Determine the maximum shear stress induced in the beam and draws the shear stress distribution for the beam section.
5. A solid and hollow shaft is made of the same material. If their outer diameters are same and inner diameter of hollow shaft is 50% of the outer diameter, calculate the torque carrying capacity of hollow shaft as compared to solid shaft.
6. A Solid round bar 3m long and 5cm in diameter is used as a column with both ends hinged. Determine the percentage change in the Euler's crippling load of the column if end conditions are changed to both end fixed. Take $E = 200\text{GPa}$.

SECTION-C

7. A bar 0.15m long and 50mm square in cross-section is subjected to an axial compressive load of 15 KN . Calculate the strain along the direction of the load if the lateral strain of the bar are prevented in the other directions. Take $E = 200\text{GPa}$ and poisson's ratio = 0.25.
8. A thin cylindrical pressure vessel is 3m long, 0.75m in diameter and 12mm thick. Calculate its dimensions when subjected to an internal pressure of 1.5 MPa . What is then the maximum shear stress in the vessel?
9. A solid steel shaft is to transmit 75Kw at 200rpm . Taking allowable shear stress to be 70 MPa , find suitable diameter of the shaft, if the maximum torque exceeds the mean torque by 30 percent. Also find the outer diameter of shaft whose inside diameter is 0.7 times the outer diameter, which can replace the solid shaft.

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.