

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER 2015

Paper Code: ETCE-203

Subject: Strength of Material

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q. no. 1 which is compulsory.
Scientific calculator is allowed.

- Q1 Attempt all of the following:- (2.5×10=25)
- The young's modulus of elasticity of a material is twice its modulus of rigidity. Find the Poisson's ratio of the material.
 - What do you mean by principal plane and principal stress?
 - A prismatic bar of volume V is subjected to a tensile force in longitudinal direction. If Poisson's ratio of the material is μ and longitudinal strain is e , find the final volume of the bar.
 - What is pure bending? Give two examples of pure bending.
 - Find the ratio of width to depth of a strongest beam that can be cut out of a cylindrical log of wood.
 - A beam of square section with side 100mm is placed with one diagonal horizontal. Find the maximum shear stress if shear force acting on the section is 12kN.
 - What is middle third rule? For no tension criteria find the expression for core of a solid circular section.
 - Explain Castigliano's first theorem.
 - A solid circular shaft of steel is 50mm in diameter. Find the power transmitted at 120 r.p.m if the permissible shear stress is 60 MPa.
 - What are the limitations of Euler's formula
- Q2 Two vertical rods, one of steel and other of copper, are each rigidly fastened at the upper end 600 mm apart. Each rod is 3.0 m long and 100mm² in cross-sectional area. A horizontal cross bar connects the lower end of rods and on it is placed a load of 100 KN so that the cross bar remains horizontal. Find the position of load on cross bar and estimate the stress in each rod. $E_{\text{steel}} = 210 \text{ GPa}$ and $E_{\text{copper}} = 120 \text{ GPa}$. (12.5)
- Q3 A simply supported beam of span L is loaded with a triangular load with intensity zero at one end and w per unit length at the other end. Draw S.F.D. and B.M.D indicating the principal values. (12.5)
- Q4 A simply supported beam of span L is loaded with u.d.l. of intensity w over the whole span. Using conjugate beam method, calculate slopes at the ends and central deflection. (12.5)
- Q5 Compare the ratio of strength of a solid steel column to that of a hollow of the same cross-sectional area. The internal diameter of hollow column is 75% of external diameter. The columns have the same length and are hinged at the ends. (12.5)
- Q6 Compare the flexural strength of the following three beams of equal weight:- (12.5)
- I-section 30cm x 15cm having 2cm thick flange and 1.25 cm thick web.
 - Rectangular section having depth equal to twice the depth.
 - Solid circular section.
- Q7 A square chimney 25m high, having an opening of 1m x 1m is subjected to a horizontal wind pressure of 1.50 KN/m². Find the necessary thickness at the base of chimney which is of brickwork. Unit weight of brick masonry is 19 KN/m³ and the maximum permissible stress on brick masonry is limited to 0.80 MPa. (12.5)
- Q8
- Explain the concept of Mohr's Circle for determining stresses and strain. (6.5)
 - Explain why do we need a failure theory. Explain in detail the concept of any one Failure theory. (6)

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