

CBCS SCHEME

17AE/AS34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Mechanics of Materials

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Derive the Equilibrium Equations for a 3-dimensional stress system. (10 Marks)
- b. Define stress at a point and explain. (06 Marks)
- c. Define plane stress and plane strain. (04 Marks)

OR

- 2 a. Enumerate the state of Tresca's criteria and Von-Mises criteria. (06 Marks)
- b. Write a note on material selection for structured performance and explain strength design. (08 Marks)
- c. The bar shown below is tested in UTM it is observed that at a load of 40kN the extension of bar is 0.285mm. Determine Young's modulus.

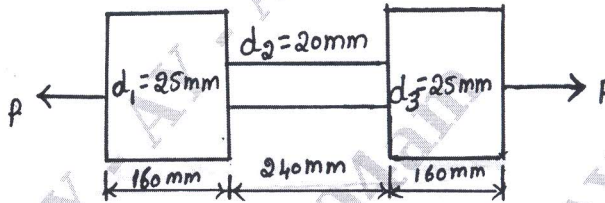


Fig Q2(c)

(06 Marks)

Module-2

- 3 a. What are Euler Bernoulli assumption and its implication explain. (08 Marks)
- b. A beam of 'T' section has a length of 2.5M and is subjected to a point load as shown in the Fig Q3(b). Calculate the compressive bending stress and plot the stress distribution across the cross section of the beam. The maximum tensile stress is limited to 300MPa. Calculate the value of 'W'.

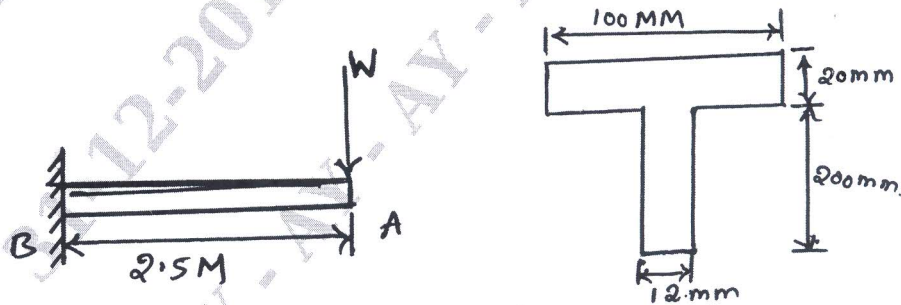


Fig Q3(b)

(12 Marks)

OR

- 4 a. Give the kinematic Description and Equilibrium Equation for beams subjected to axial load and explain. (10 Marks)
- b. Give the kinematic Description and Equilibrium Equation for Beams subjected to Transverse load and explain. (10 Marks)

Module-3

- 5 a. A hollow circular steel shaft has to transmit 60kW at 210rpm such that maximum shear stress does not exceed 60mN/m^2 . If the ratio of internal to external diameter, is equal to $\frac{3}{4}$ and the value of rigidity modulus is 84GPa. Find the dimension of the shaft and angle of twist in a length of 3m. (10 Marks)
- b. Discuss the application of Von Mises criteria and Tresca's criteria for a propeller shaft under Torsion combined with Bending moment and axial load. (10 Marks)

OR

- 6 a. Evaluate the distribution of shear flow for a thin walled C-channel shown in Fig. Q6(a).

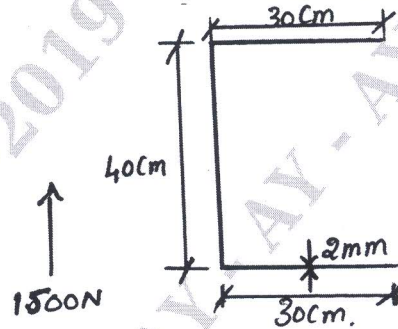


Fig Q6(a)

- b. Define the following :
- Shear flow
 - Shear centre
 - Elastic axis

(15 Marks)

(05 Marks)

Module-4

- 7 a. Explain the following :
- Principle of virtual work for a particle
 - Principle of complementary virtual work.
- b. Explain the concept of work. (04 Marks)

(16 Marks)

OR

- 8 a. Explain SAINT-VENANT's principle. (06 Marks)
- b. Explain Maxwell Reciprocal Theorem. (08 Marks)
- c. Define a conservative force and obtain the workdone by conservative force along any path joining two points. (06 Marks)

Module-5

- 9 a. Explain Tresca's and Von Mises criteria. (08 Marks)
- b. Explain the following :
- Rigid Bar with Root Torsional spring
 - Buckling of cantilever Beam. (12 Marks)

OR

- 10 a. What is Kirchoff plate theory and mention its assumption. (08 Marks)
- b. Deduce the Differential equations for Anisotropic plates. (12 Marks)
