B. Tech. Sem - III (2021-course) Robotics · Winter-2022

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - III Robotics & Automation Engineering : WINTER- 2022
SUBJECT : STRENGTH OF MACHINE COMPONENTS

Day : Tuesday | Time : 10:00 AM-01:00 PM
Date : 13-12-2022 | **W-25354-2022** | Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary.
4) Use of non-programmable **CALCULATOR** is allowed.
5) Assume suitable data if necessary.

Q.1 The following data relate to a bar subjected to a tensile test: **[10]**

Diameter of the bar	d = 35 mm
Tensile load	P = 55kN
Gauge length	l = 300 mm (= 0.3m)
Extension of the bar	δ = 0.112 mm
Change in diameter	δ = 0.00366 mm

Calculate: **i)** Poisson's ratio **ii)** The value of three moduli.

OR

Q.1 An elastic bar of modulus of elasticity E of uniform cross-section and length L is held between two rigid supports A and B. It carries an axial load P at C as in figure. (AC = L_1, CB = L_2). Compute the nature and magnitude of the reactions developed at A and B. **[10]**

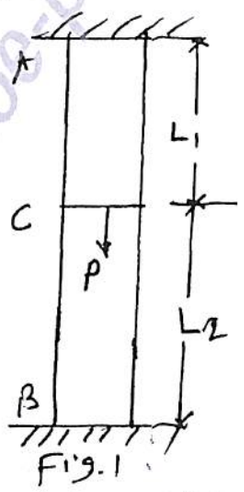


Fig. 1

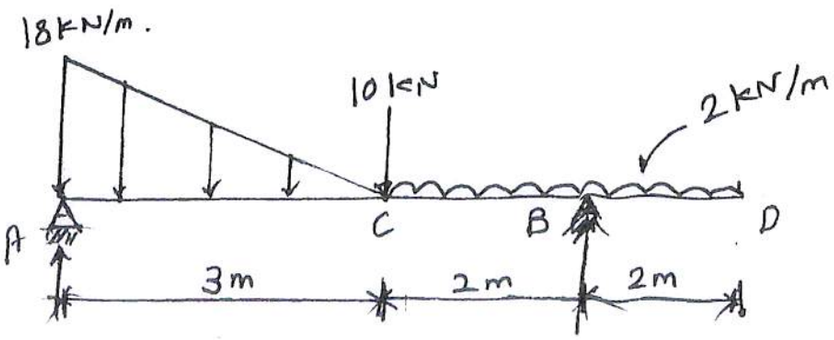
Q.2 At a point in a strained material the normal stresses acting are +60 MPa and – 30 MPa at a plane right angle to each other, with a shear stress of 20 MPa. Determine: **[10]**

i) Principal stresses and their nature.
ii) Normal and tangential stress on a plane inclined at angle of 25° with the plane of +60MPa.

OR

Q.2 Explain in detail St. Venants theory of failure. **[10]**

Q.3 Draw SFD and BMD **[10]**



P.T.O.

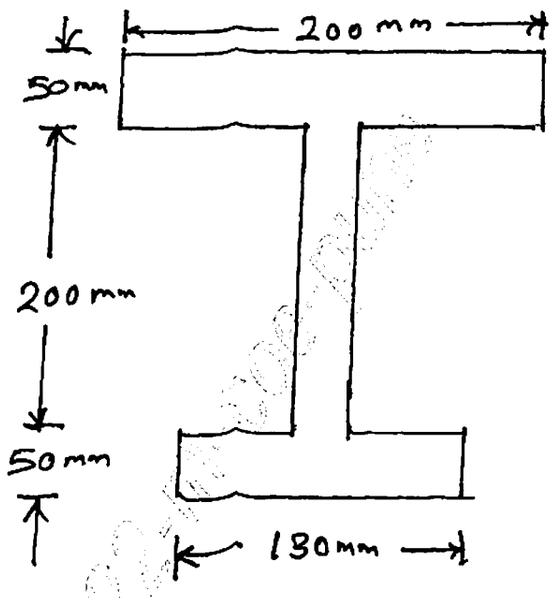
OR

Q.3 Simply supported beam subjected a clock wise couple M at a distance 'a' from left support. Determine the slope at supports and deflection under couple. **[10]**

Q.4 A beam of T section, 4 m long carries an u.d.l 'w' per meter run through its length. The beam is simply supported at it's end. The T section is 20 × 10 × 1.2 cm i.e., web is 18.8 × 1.2 cm and flange is 10 × 1.2 cm what is the maximum value of 'w' that the stress in the section does not exceed 60 MPa. **[10]**

OR

Q.4 The shear force acting on a beam at an I-section with unequal flanges is 60kN. The section is shown in figure 4 . The moment of inertia of the section about N.A. is 2.849×10^4 mm^4. Calculate the shear stress at the N.A. and also draw the shear stress distribution over the depth of the section **[10]**



Q.5 A solid steel shaft has to transmit 75kW at 200 r.p.m. Taking allowable shear stress as 75N/mm^2. Find suitable diameter for the shaft, if the maximum torque transmitted at each revolution exceeds the mean by 30%. **[10]**

OR

Q.5 Determine the diameter of a solid shaft which will transmits 300 kW at 255 r.p.m. The maximum shear stress should not exceed 30 N/mm^2 and twist should not be more than 1° in a shaft length of 2 m.
Take modulus of rigidity = 1×10^5 N/mm^2. **[10]**

Q.6 A bar 12 mm in diameter gets stretched by 3 mm, under a steady load of 8000 N, what stress would be produced in the same bar by a weight of 800 N, which falls vertically through a distance of 80 mm on a rigid collar at its end? The bar is initially unstressed. **[10]**

OR

Q.6 A steel bar of rectangular cross section 80 mm × 120 mm and pinned at each end is subjected to axial compression. If the proportional limit of the material is 235 MPa and E = 207 GPa, determine the minimum length for which Euler's equation may be used to determine the buckling load. **[10]**

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