

B. Tech. Sem - III (Mechanical Engg.) (2014 COURSE) (CBCS) :

WINTER - 2018

SUBJECT: SOLID MECHANICS

Day: Monday
Date: 26/11/2018

W-2018-2311

Time: 10.00 AM TO 01.00 PM
Max Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Only half imperial size drawing sheets should be used.
- 4) Assume suitable data if necessary.

Q.1 a) A bar of 30 mm diameter is subjected to a pull of 60 KN. The measured extension on a gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0039 mm, calculate the poisson ratio and the values of the three moduli (10)

OR

b) A 10 mm diameter mild steel bar of length 1.50 meter is stressed by a weight of 120 N dropping freely through 20 mm before commencing to stretch the bar. Find the maximum instantaneous stress and the elongation produced in the bar. Take $E = 2 \times 10^5 \text{ N/mm}^2$ (10)

Q.2 a) In a two dimensional stress system, two mutually perpendicular planes at carrying tensile and compressive stresses and shearing stress of 30 MPa. If the principal stresses are known to be 20 MPa and 80 MPa. Determine the values of the stresses σ_x and σ_y . (10)

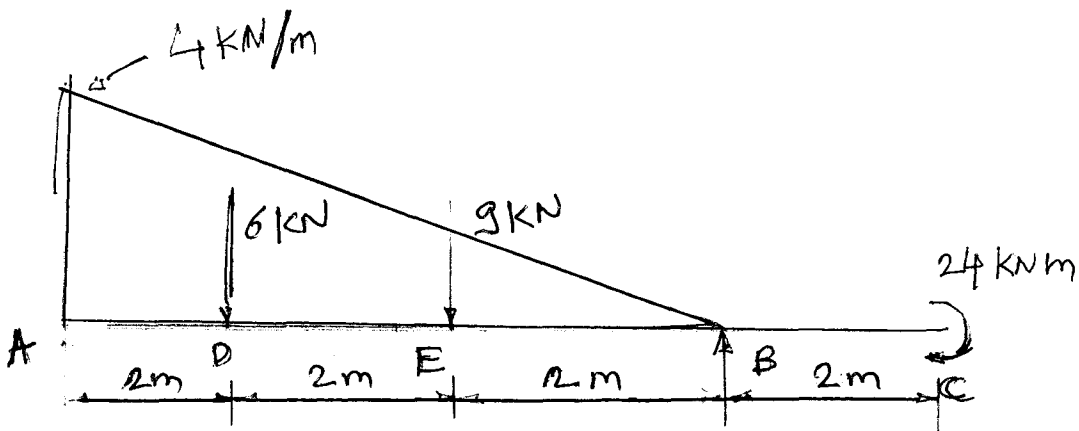
OR

b) What are various theories of failure? Explain in detail (10)
i) Maximum principle stress theory.
ii) Maximum shear stress theory.

Q.3 a) A horizontal beam is simply supported at the ends and carries a uniformly distributed load of 10 KN/m between the supports placed 10 m apart. Anticlockwise moment of 150 KN-m and 100 KN-m are applied to the left and right ends of the beam at the supports. Determine the position and magnitude of the maximum bending moment and draw S.F and B.M diagrams. (10)

OR

b) Draw shear force and Bending moment diagram of given figure also find (10)
Point of contra flexure if any.



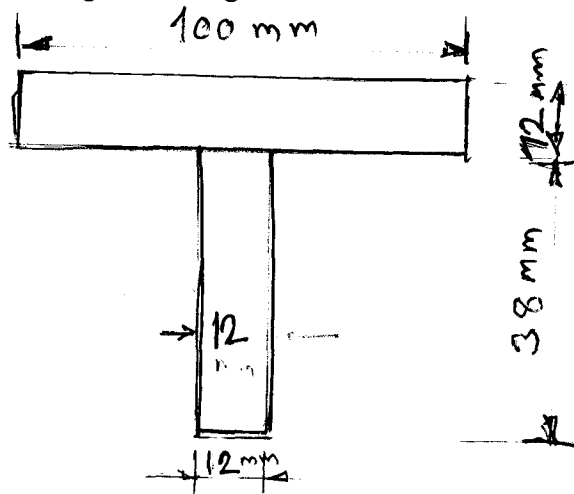
P.T.O.

- Q.4 a) In a tensile test a test piece of 25 mm diameter, 200 mm gauge length stretched 0.0975 mm under a pull to 50 KN. In a torsion test, the same rod twisted 0.025 radian over a length of 200 mm when a torque of 0.4 KN-m was applied. Evaluate Poisson's ratio and the three moduli for the material. (10)

OR

- b) A 100mm diameter shaft is subjected to Bending moment 'M' and a twisting moment 'T' the magnitude of maximum principal stress due to these moment is 110 MPa. If maximum bending stress due M is same as the maximum shear stress to T. Evaluate M and T (10)

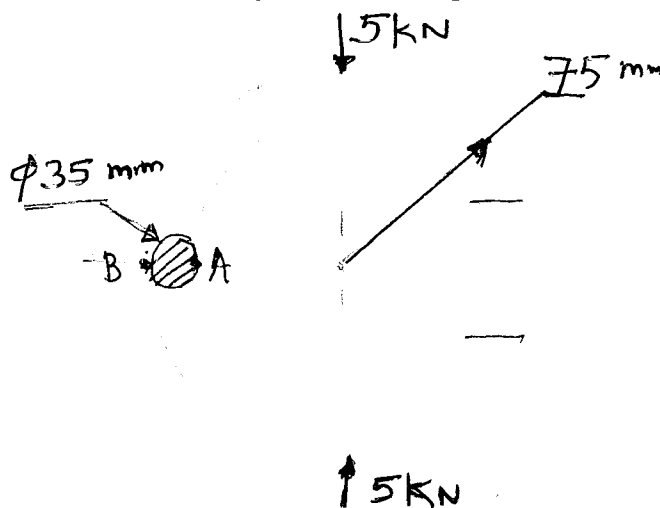
- Q.5 a) A cantilever beam has T shaped cross section. It is acted upon by a clockwise couple 'M' at free end .Determine 'M' if allowable stresses in bending in tension and compression are 40 MPa and 105 MPa respectively also draw Bending stress diagram. (10)



OR

- b) An I section beam 340 mm X 200 mm has a web thickness 10 mm and flange thickness of 20 mm it carries a shearing force of 100 KN. Sketch the shear stress distribution across the section. (10)

- Q.6 a) Calculate the stress at a point A and B for a circular beam as shown in figure. (10)
The circular beam is subjected to a compressive load of 5 KN



OR

- b) Explain in detail design procedure for cotter joint with neat sketch. (10)

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