

14/12/22 (10)

Exam.Code:0939
Sub. Code: 6702

2122
B.E. (Mechanical Engineering)
Third Semester
MEC-302: Machines of Materials

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit. Assume suitably the missing data, if any. Supplement your answer with neat and labeled sketches wherever required.

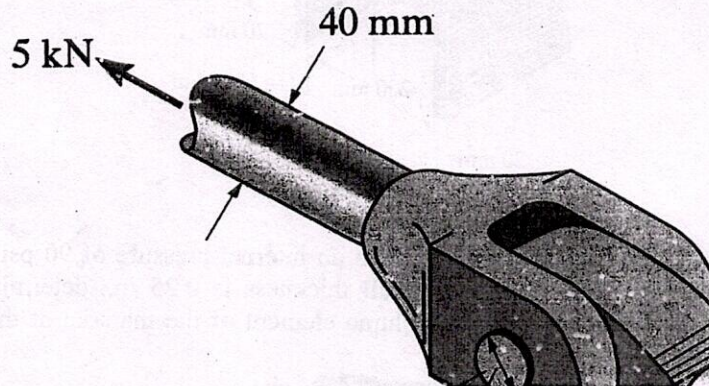
x-x-x

1. Attempt the following:-

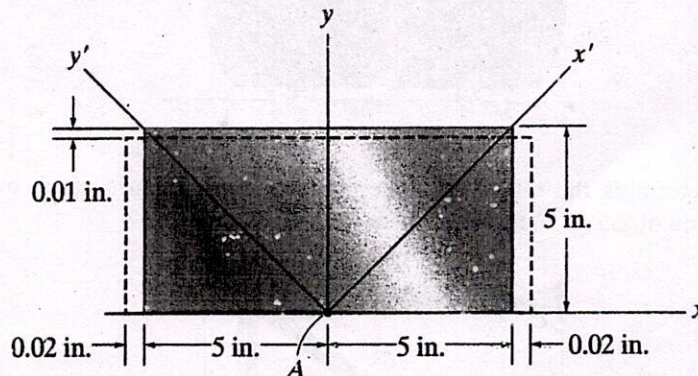
- What do you understand by the term "Theories of failure"? Name the important theories of failure.
- Define thin cylinders. Give at least two examples.
- Differentiate between Polar Moment of Inertia versus Area Moment by giving an example.
- Differentiate between Cantilever Beam versus Simply Supported Beam by drawing a sketch.
- What is meant by pure bending? (5x2)

UNIT - I

2. The yoke-and-rod connection is subjected to a tensile force of 5 kN. Determine the average normal stress in each rod and the average shear stress in the pin A between the members. (10)



3. The rectangular plate undergoes a deformation shown by the dashed lines. Determine the shear strain γ_{xy} and shear strain $\gamma_{x'y'}$ at point A.

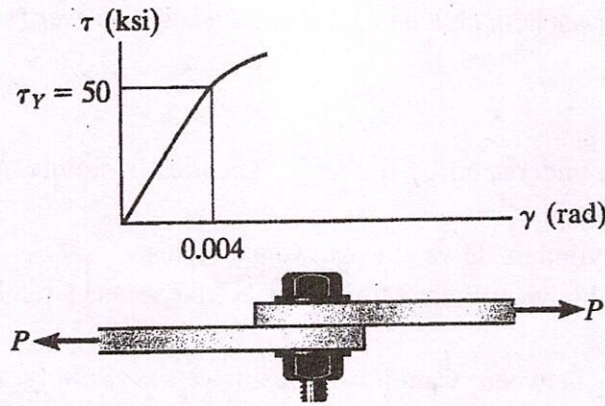


(10 Marks)

P.T.O

(2)

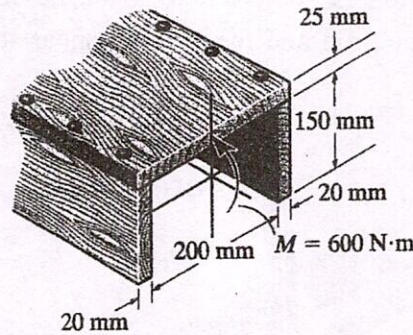
4. The shear stress-strain diagram for an alloy is shown in the figure. If a bolt having a diameter of 0.25 in. is made of this material and used in the lap joint, determine the modulus of elasticity E and the force P required to cause the material to yield. Take $n = 0.3$.



(10 Marks)

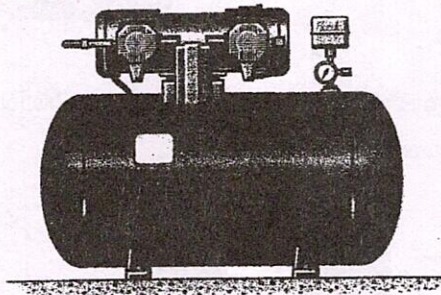
UNIT-II

5. The beam is made from three boards nailed together as shown. If the moment acting on the cross section is $M = 600 \text{ Nm}$, determine the resultant force the bending stress produces on the top board.



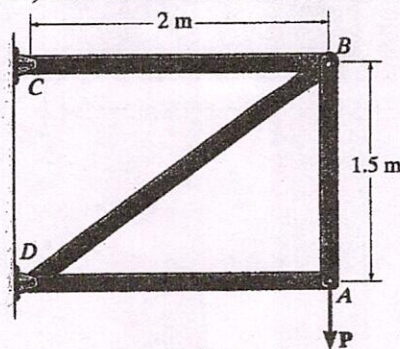
(10 Marks)

6. The tank of the air compressor is subjected to an internal pressure of 90 psi. If the inner diameter of the tank is 22 in., and the wall thickness is 0.25 in., determine the stress components acting at point A . Draw a volume element of the material at this point, and show the results on the element.



(10 Marks)

7. If $P = 60 \text{ kN}$, determine the total strain energy stored in the truss. Each member has a cross-sectional area of $2.5 (10^3) \text{ mm}^2$ and is made of A-36 steel.



(10 Marks)