Ex./ARCH/CE/T/123/2018

BACHELOR OF ARCHITECTURE ENGINEERING EXAMINATION, 2018

(1st Year, 2nd Semester)

Structural Mechanics - II

Time : Three hours Full Marks : 100

Answer any ***all*** questions.

1. (a) Draw the stress-strain curve of tensile test of mild steel and describe the salient features of it. $12^1/_2$

   (b) A hollow steel cylinder surrounds a said copper cylinder and the assembly is subjected to an axial loading of 200 KN as shown in figure. The cross sectional area of the steel is20 cm^2, while that of the copper is 60 cm^2. Both cylinders are the same length before the load is applied. Determine the temperature rise of the entire system required to place all of the load on the copper cylinder. The cover plate at the top of the assembly is rigid. For copper E = 100 GPa, $\alpha = 1.7 \times 10^{-6}/°C$, while for steel E = 200 GPa, $\alpha = 12 \times 10^{-6}/°C$ $12^1/_2$

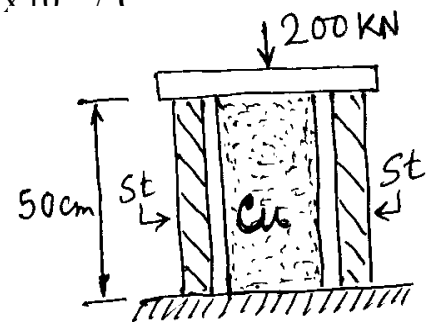


Fig. - 1(b)

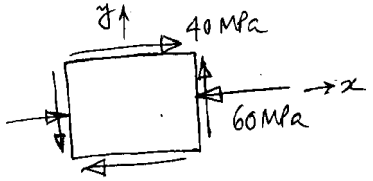
(Turn Over)

2. (a) What is normal stress and what is shear stress ? What is principal stress ? A plane element in a body is subjected to a normal compressive stress in the x-direction of 60 MPa as well as a shearing stress of 40 MPa as shown in the figure. 15

(i) Determine the normal and shearing stress in tensities on a plane inclined at an angle of 30 to the normal stress.

(ii) Determine the maximum and minimum values of the normal stress that may exist on inclined planes and the directions of these stresses.

(iii) Find the magnitude and direction of the maximum shearing stress that may exist on an inclined plane. You may use Mohr's Circle method.



(Fig. - 2a)

(b) Prove that $d = \dfrac{E}{2(1+\mu)}$

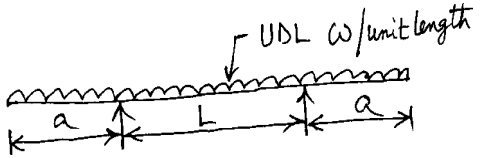
where G = Modulus of elasticity in shear

E = Modulus of elasticity

μ = Poisson's ratio. $12^1/_2$x2

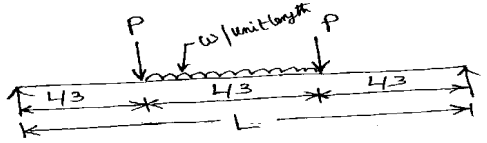
3. (a) Draw the shear force and bending moment diagram of the followings : $12^1/_2$x2

(i)



(Fig. 3.(a)

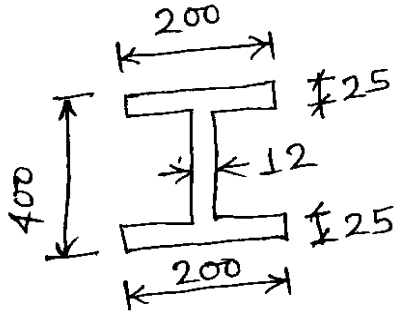
(ii)



(Fig. - 3a ii)

4. (a) Prove that $\dfrac{E}{R} = \dfrac{M}{I} = \dfrac{\sigma}{y}$ in case of pure bending where all the terms indicate the normal meaning. 15

(b) Determine the section modulus of the given I section. If the maximum permissible stress is 165 N/mn^2 in bending, find out the maximum moment carrying capacity of the beam seaction. 10



(Fig. - 4 b)

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