ID:- 15799

Semester:- B-Tech 3rd year

Subject:- Mechanics of material

Assignment:- 01

Submitted to:- Sir Maruan.

A solid shaft of 80mm diameter rotates with 300 rpm if permissible shear stress is 130 Mpa find torque

Given data:-

As we know that

$D = 80mm$

$N = 300 rpm$

Solution:-

$T = \pi/16 * t * D(3)$

$T = 1307079$

$T = 1308 kNmm$ Answer

External and internal diameter of a

of a propeller shaft are 500mm and 350mm respectively. Find maximum shear stress developed in the cross section when a twisting moment of 60 kN-m is applied. If span of shaft is 6m, also find twisting angle of shaft

Given data:-

D = 500 mm

d = 350 mm

T = 60 kN-m

L = 6m

Solution:- As we know that

$T = \pi/16 * t * D(4) - d(4)/D$

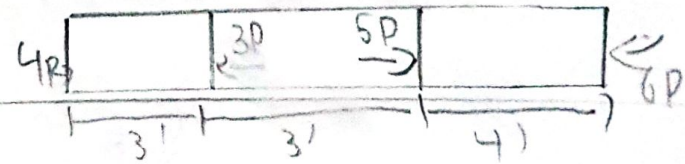
$60 * 1000000 = 3.149/16 * t * 500(4) - 350(4)/500$

$t = 3.708 kN/mm(2)$ $t/R - G\theta/t$ .... $R - D/2$ --- $500/2 = 250$ mm

$= 0.081$ radians

An aluminum bar having a cross-sectional area of 2.5 in^2 cm carries the axial loads applied at the positions shown in fig. below Compute the total changes in length of the bar if $E = 20 * 10^6$ psi and $P = 3500$ lb. Assume the bar is suitably braced to prevent lateral buckling

$A_{area} = 2.5 in^2$

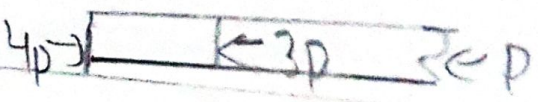


$E = 20 * 10^6$ psi

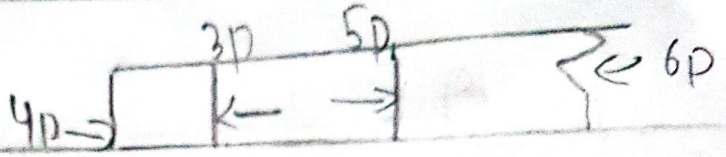
$P = 3500$ lb

Solution:- $P_1 = 4P$

$P_2 = P$



$P_3 = 6P$



$$\delta = \frac{PL}{AE}$$

$$\Rightarrow \delta = \delta_1 + \delta_2 + \delta_3$$

$$\Rightarrow \delta_T = \frac{P_1 L}{AE} + \frac{P_2 L}{AE} + \frac{P_3 L}{AE}$$

$$\Rightarrow \delta_T = \frac{4P(3\times 10)}{(2.5)(20\times 10^6)} + \frac{P(3\times 10)}{(2.5)(20\times 10^6)} + \frac{6P(4\times 10)}{(2.5)(20\times 10^6)}$$

$$0.016 + 2.58 + 0.096$$

$$\delta t = 2.49 \text{ Tensile}$$

An aluminum rod is rigidly attached b/w a steel rod and a bronze rod as shown in fig below. Axial loads are applied at the positions indicated. Find the maximum value of P that will not exceed a stress in steel of steel of 200 Mpa, in aluminum of 140 Mpa, or in a bronze of 130 Mpa - Taking diagram from the paper)

Solution:- For Bronze

$$\sigma_{bronze} * A_{bronze} = 3P$$

$$130(300) = 3P \Rightarrow 39000\,N$$

For Aluminum

$$\sigma_{aluminum} A_{Si} = P$$

$$140(400) = P \Rightarrow 56000\,N$$

For steel safe

P, use $P = 30000\,N = 30kN$ Answer