1.2-1

Bar in tension

$d_{AB} = 1.75$ in. $d_{BC} = 1.25$ in.

$\sigma_{AB} = 5000$ psi   Find σ_{BC}

$\sigma = \dfrac{P}{A}$ and $P = \sigma A$

$\therefore P = \sigma_{AB} A_{AB} = \sigma_{BC} A_{BC}$

$(5000 \text{ psi})(\frac{\pi}{4})(1.75 \text{ in.})^2 = \sigma_{BC}(\frac{\pi}{4})(1.25 \text{ in.})^2$

$\sigma_{BC} = (5000 \text{ psi})\left(\dfrac{1.75 \text{ in.}}{1.25 \text{ in.}}\right)^2$

$= 9800$ psi ←

1.2-2

Free-body diagram of brake pedal

F = compressive force in piston rod

d = diameter of piston rod = 5 mm

Equilibrium of brake pedal

$\Sigma M_A = 0$

$F(50 \text{ mm}) - P(275 \text{ mm}) = 0$

$F = P\left(\dfrac{275 \text{ mm}}{50 \text{ mm}}\right) = (40 \text{ N})\left(\dfrac{275}{50}\right) = 220 \text{ N}$

Compressive Stress in Piston rod (d = 5 mm)

$\sigma_C = \dfrac{F}{A} = \dfrac{220 \text{ N}}{\frac{\pi}{4}(5 \text{ mm})^2} = 11.2$ MPa ←

1.2-3

Aluminum tube in compression

L = 20 in.

Outside diameter $d_2 = 2.4$ in.

Inside diameter $d_1 = 2.0$ in.

CONT.

(a) Shortening δ of the bar

$\epsilon = 570 \cdot 10^{-6}$

$\delta = \epsilon L = (570 \cdot 10^{-6})(20 \text{ in.})$

$= 0.0114$ in. ←

(b) Compressive load P

$\sigma = 6$ ksi

$A = \dfrac{\pi}{4}[d_2^2 - d_1^2] = \dfrac{\pi}{4}[(2.4 \text{ in.})^2 - (2.0 \text{ in.})^2]$

$= 1.382$ in.²

$P = \sigma A = (6 \text{ ksi})(1.382 \text{ in.}^2)$

$= 8290$ lb ←

1.2-4

Concrete Pedestal in Compression

Use the following areas:

$A_1 = (1.2 \text{ m})(0.5 \text{ m}) = 0.6$ m²

$A_2 = A_4 = \frac{1}{2}(0.4 \text{ m})(0.4 \text{ m}) = 0.08$ m²

$A_3 = (0.4 \text{ m})(0.4 \text{ m}) = 0.16$ m²

$A = A_1 + 2A_2 + A_3$

$= 0.6 \text{ m}^2 + 2(0.08 \text{ m}^2) + 0.16 \text{ m}^2$

$= 0.92$ m²

(a) Average compressive stress σ_z

$P = 11.5$ MN

$\sigma_z = \dfrac{P}{A} = \dfrac{11.5 \text{ MN}}{0.92 \text{ m}^2} = 12.5$ MPa ←

(b) Coordinates of centroid C

From symmetry, $\bar{z} = \dfrac{1.2 \text{ m}}{2} = 0.6$ m ←

$\bar{x} = \dfrac{\Sigma \bar{x}_i A_i}{A}$ (See Chapter 12, Section 12.3, Eq. 12-7a)

$\bar{x} = \dfrac{1}{A}(\bar{x}_1 A_1 + 2\bar{x}_2 A_2 + \bar{x}_3 A_3)$

$= \dfrac{1}{0.92 \text{ m}^2}[(0.25 \text{ m})(0.6 \text{ m}^2) + 2(0.6333 \text{ m})(0.08 \text{ m}^2)$
$+ (0.7 \text{ m})(0.16 \text{ m}^2)] = 0.395$ m ←

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Table of Contents Elasticity Timoshenko Solution Manual

1. Understanding the eBook Elasticity Timoshenko Solution Manual
    - The Rise of Digital Reading Elasticity Timoshenko Solution Manual
    - Advantages of eBooks Over Traditional Books
2. Identifying Elasticity Timoshenko Solution Manual
    - Exploring Different Genres
    - Considering Fiction vs. Non-Fiction
    - Determining Your Reading Goals
3. Choosing the Right eBook Platform
    - Popular eBook Platforms
    - Features to Look for in an Elasticity Timoshenko Solution Manual
    - User-Friendly Interface
4. Exploring eBook Recommendations from Elasticity Timoshenko Solution Manual

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based DC motor. The novel methodology relies on merge proper tuning with ... Modelling and Simulation for Industrial DC Motor Using ... by AAA Emhemed · 2012 · Cited by 61 — The main objective of this paper illustrates how the speed of the DC motor can be controlled using different controllers. The simulation results demonstrate ... Stability and performance evaluation of the speed control ... by SA Salman · 2021 · Cited by 3 — This paper presents the design of a state-feedback control to evaluate the performance of the speed control of DC motor for different applications. The. Precision Speed Control of A DC Motor Using Fuzzy Logic ... Precision Speed Control of A DC Motor Using Fuzzy Logic Controller Optimized by ... Universiti Teknologi Malaysia, ACKNOWLEGMENT Johor, Malaysia, in 2011. He ... DC Motor Control | Automation & Control Engineering Forum Jun 20, 2022 — I have a 1 HP DC motor that I'm currently manually controlling using a Dayton 1F792 DC Speed Control unit. I want to automate the following ...