ERRATA for

PE Mechanical Engineering: Machine Design and Materials Practice Exam

ISBN: 978-1-932613-77-3

Errata posted 10/22/2018

Revisions are shown in red.

Solution 112, p. 73:

$$K\delta_s = \frac{AE}{\ell}\left(\alpha \ell \Delta T - \delta_s\right)$$

$$\delta_s = \frac{\alpha \ell \Delta T}{1 + \frac{K\ell}{AE}} = \frac{\left(6\times10^{-6}\right)(36)(300)}{1 + \frac{(10{,}000)(36)}{[0.375]30\times10^{6}}} = 0.0628 \text{ in.}$$

$F = K\,\delta_s = (10{,}000)\,(0.0628) = 628$ lb

THE CORRECT ANSWER IS: (C)

Previously posted errata continued on next page

ERRATA for

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Revisions are shown in red.

Question 108, p. 13:

$$\text{Critical speed} = \frac{215}{L^2}\sqrt{\frac{gEI}{\rho A}}$$

where:

L	=	length of lead screw
E	=	modulus of elasticity
I	=	area moment of inertia
ρ	=	density
A	=	cross-sectional area
g	=	acceleration of gravity

Question 121, p. 23:

In the figure, M = 27,000 in.-lb

Question 510, p. 46:

Option A should read as follows:

(A) 0.19

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Question 516, p. 49:

The last sentence should read as follows:

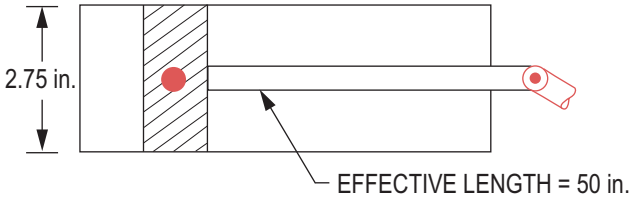
If the element is supported in all directions at the location shown in the bottom figure, the failure load will:

Question 533, p. 60:

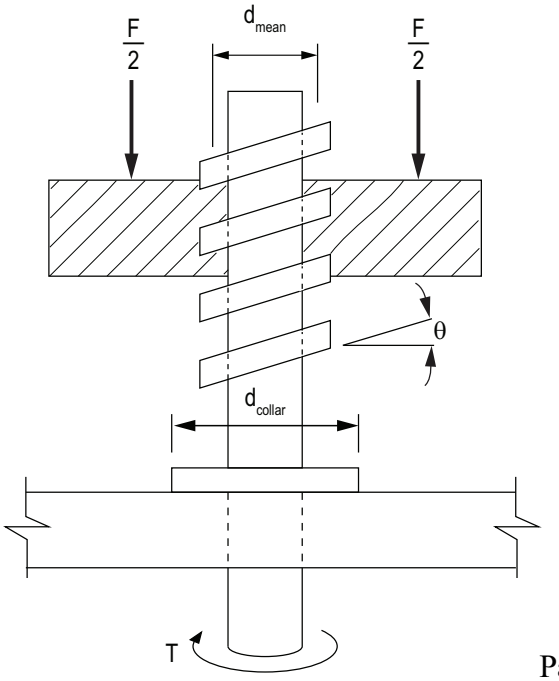
The first sentence should read as follows:

The hydraulic cylinder shown in the figure has a 2.75-in.-diameter piston (Area, A = 5.94 in^2) and is subjected to a maximum load from a maximum pressure of 3,000 psi.

Pins have been added to the figure as shown:



Question 537, p. 63:



d_{collar} = 1.75 in.
f_{collar} = 0.05
d_{mean} = 1.50 in.
f_{screw} = 0.08
θ = 3.033°
4 tpi

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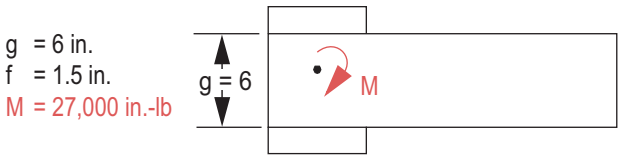
Solution 121, p. 79:



$$J_u = \frac{f(3g^2 + f^2)}{6}$$

$$J = 0.707\, h\, J_u = \frac{0.707}{6} h\, f(3g^2 + f^2)$$

$$r = \frac{\sqrt{f^2 + g^2}}{2}$$

$$\tau'' = \frac{mr}{J} = \frac{6\, M \sqrt{f^2 + g^2}}{2(0.707)\, h\, f(3g^2 + f^2)}$$

$$h = \frac{6\, M \sqrt{f^2 + g^2}}{1.414\, \tau''\, f\, (3g^2 + f^2)}$$

$$= \frac{6\,(27{,}000)\sqrt{1.5^2 + 6^2}}{1.414\ \ (12{,}000)\,(1.5\text{ in.})\,(3 \times 6^2 + 2.25)} = 0.357\text{ in.}$$

$$= 3/8\text{ in.}$$

THE CORRECT ANSWER IS: (B)

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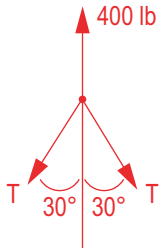
Solution 510, p. 94:

Force on ceiling = mg = 400 lb



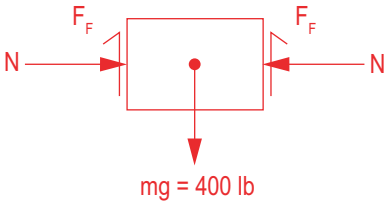
Tension in chains: $2T \cos 30° = 400$ lb

$T = 231.2$ lb

Components $T_H = T \sin 30° = 115.6$ lb

$T_V = T \cos 30° = 200.2$ lb

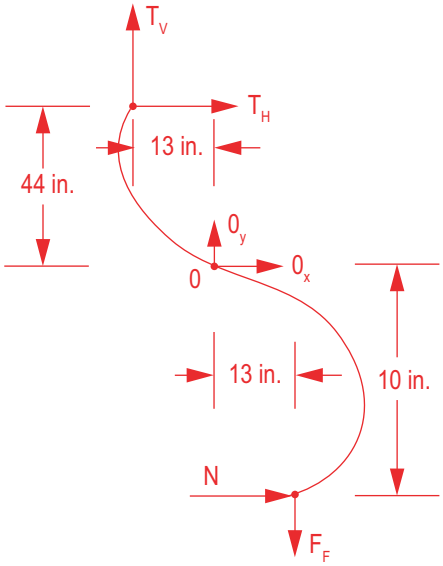
Force on 400 lb block



$\circlearrowleft + \quad \sum F_y = 0 \qquad 2F_F = 2\mu N = 400$ lb

or $\mu N = 200$ lb

Free-body diagram of 1/2 device



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Errata posted 12/18/2017

Solution 510, p. 94 (continued):

$\Sigma M_0 = 0$

$-13T_V - 44T_H - 13\ F_F + 10N = 0$

$-(13)(200.2) - (44)(115.6) - (13)(200) + 10N = 0$

$N = 1{,}028.9$ lb

$\mu N = 200$

$\mu(1{,}028.9) = 200$

$$\mu = \frac{200}{1{,}028.9} = 0.19$$

THE CORRECT ANSWER IS: (A)

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Solution 516, p. 97:

Check maximum compression load

$\sigma = P/A$

Allowable force, $P = \sigma A = \left(432 \times 10^6\ \text{N/m}^2\right)(0.100\,\text{m})(0.25\,\text{m})$

$P_{compression} = 10{,}800{,}000$ N This is the maximum compressive load that can be sustained.

$$\sigma_e = \frac{\pi^2 E}{(L/k)^2}$$

$$I = \frac{bh^3}{12} = \frac{(0.250)(0.100)^3}{12}$$

$$I = 2.083 \times 10^{-5}\,\text{m}^4$$

$$P_{cr} = \frac{C\pi^2 EI}{l_{eff}^2}$$ C = 1 for pinned

$$P_{cr} = \frac{\pi^2 \left(70 \times 10^9\right)\left(2.083 \times 10^{-5}\right)}{(2)^2}$$

$P_{cr} = 3{,}594{,}670$ N

$l_{eff} = 1$ m

$$P_{cr} = \frac{\pi^2 \left(70 \times 10^9\right)\left(2.083 \times 10^{-5}\right)}{1^2}$$

$P_{cr} = 14{,}376{,}282$ N Exceeds compressive capacity so use $P_{compression}$.

Failure is increased by $\frac{P_{compression}}{P_{cr}} = \frac{\text{failure in compression}}{\text{failure in buckling}} = \frac{10{,}800{,}000}{3{,}594{,}670} = 3.0$

THE CORRECT ANSWER IS: (B)

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Solution 519, p. 98:

Point (5) is outside the area of acceptable design (fatigue failure). Points on the Goodman Line have a limited fatigue life.

THE CORRECT ANSWER IS: (B)

Solution 533, p. 104:

$$\sigma_{cr} = \frac{P_{cr}}{A_{rod}}$$

Using safety factor of 2 to S_y.

$$\frac{P_{cr}}{A_{rod}} = \frac{36,500}{2} = 18,250 \text{ psi}$$

$$P_{cr} = P \bullet A_{piston} = 3,000 \times 5.94$$

$$= 17,820 \text{ lbf}$$

$$A_{rod} = \frac{P_{cr}}{18,250} = \frac{17,820}{18,250} = 0.9764$$

$$A_{rod} = \frac{\pi d_{rod}^2}{4} \Rightarrow d_{rod} = \sqrt{\frac{4A_{rod}}{\pi}} = 1.11$$

THE CORRECT ANSWER IS: (A)

Previously posted errata continued on next page

ERRATA for

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Errata posted 3/31/2017

Revisions are shown in red.

Solution 506, p. 92:

Line 1 of the solution should read as follows:

$$\sin\theta = \frac{5}{12}$$

Previously posted errata continued on next page

ERRATA for

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Errata posted 2/17/2017

Revisions are shown in red.

Question 105, p. 11:

Line 2 should read as follows:

If the delivery of parts from Source Y is delayed by 3 days, the total completion delay (days) will be most nearly:

(A) 0
(B) 1
(C) 2
(D) 3

Question 111, p. 16:

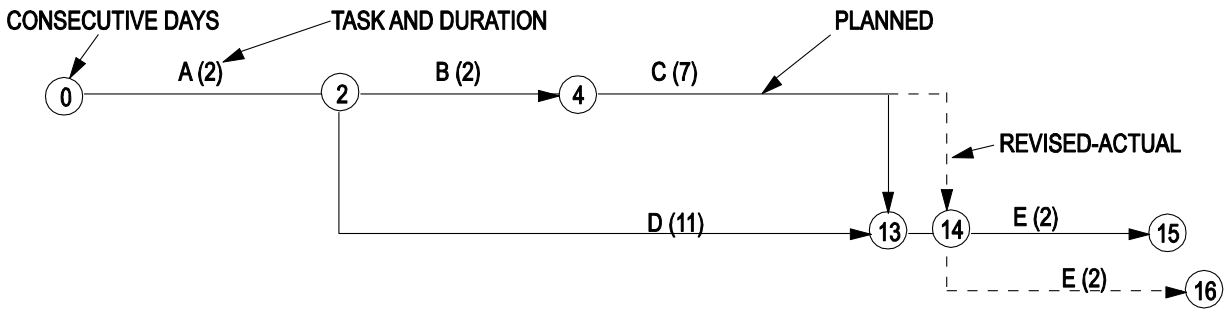
Line 1 should read as follows:

A circular rod will be loaded in simple tension. The rod has a length of 10 in. and a diameter of 3/8 in. Data for available materials are as follows:

Solution 105, p. 70:

The first paragraph should read as follows:

If Task C is delayed by 3 days, but Task C has 2 days of slack from initial critical path, then ABCE becomes the new critical path, and the total completion delay will be 1 day.



THE CORRECT ANSWER IS: (B)