Machine Design PE References Exam Errata

This product has been updated to incorporate all changes shown in the comments on the webpage and email comments as of October, 30 2017. If you have purchased this product prior to this date and wish for the latest version then please email Justin Kauwale at contact@engproguides.com.

The following changes have not been incorporated into the product as of the date above and should be noted.

Problem 20 was adjusted as shown in the following pages.

QUESTION 19

A straight bevel gear and pinion are at 90 degree angles to each other. The diametral pitch is ½", the pinion has 10 teeth and the gear has 30 teeth. The pressure angle is 20 degrees. The horsepower is 5 HP and the pinion speed is 150 RPM. What is the force acting upon the pinion shaft?

(A) 24 LBS

(B) 106 LBS

(C) 210 LBS

(D) 311 LBS

QUESTION 20

A power screw is used to lower a load of 10,000 lbs. The coefficient of friction is 0.10. The mean diameter is 3" and the pitch is 0.25". The power screw has 4 threads per inch, 1 start and a lead of 0.25 in/rev. Assume no thrust or collar bearing. What is the torque required to lower the load in LB-IN?

(A) 420 LB-IN

(B) 840 LB-IN

(C) 1,099 LB-IN

(D) 1,520 LB-IN

SOLUTION 20

A power screw is used to lower a load of 10,000 lbs. The coefficient of friction is 0.10. The mean diameter is 3" and the pitch is 0.25". The power screw has 4 threads per inch, 1 start and a lead of 0.25 in/rev. Assume no thrust or collar bearing. What is the torque required to lower the load in LB-IN?

(A) 420 LB-IN

(B) 840 LB-IN

(C) 1,099 LB-IN

(D) 1,520 LB-IN

The equation to solve this problem is in **Shigley's Mechanical Engineering Design, Chapter 8 Screws Fasteners and the Design of Non-Permanent Joints.** The only difference is that there is no thrust or collar bearing.

$$T_L = \frac{F d_m}{2}\left(\frac{\pi f d_m - l}{\pi d_m + f l}\right) + \frac{\cancel{F f_c d_c}}{\cancel{2}}$$

Now pug in the values.

$$T_L = \frac{10{,}000 * 3"}{2}\left(\frac{\pi * 0.1 * 3" - 0.25"}{\pi * 3" + 0.1 * 0.1 * 0.25"}\right) = 1{,}099\ lb - in$$

The correct answer is most nearly, **(C) 1,099 LB-IN**

QUESTION 33

Which of the following bolt configurations will achieve a safety factor closest to 2.0? The bolts are UNC and have a proof strength of 33 ksi. The actual load is 10,000 lbs.

(A) Two 1” bolts.

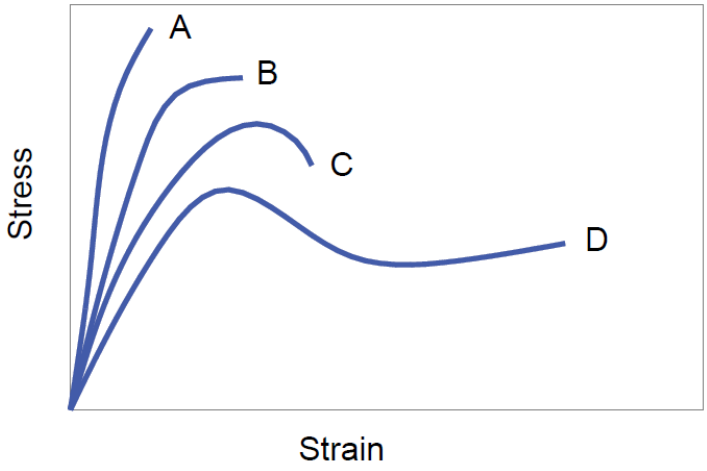
(B) Two 1-1/8” bolts.

(C) Two 1-1/4” bolts.

(D) Two 1-1/2” bolts.

QUESTION 34

Which of the following statements is true about the graph below?



(A) Curve A representative of a ductile material.

(B) Curve B has a higher modulus of elasticity than curve A.

(C) Curve C has lower yield strength than curve B.

(D) Curve D is representative of a plastic material.

SOLUTION 33

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(B) Two 1-1/8" bolts.

(C) Two 1-1/4" bolts.

(D) Two 1-1/2" bolts.

For this problem you need the tensile stress area for UNC screws, which can be found in Machinery's Handbook, Unified Screw Threads Table 4a. The coarse thread series, UNC/UNRC is the most common production of bolts, screws and nuts.

Size	Tensile Stress Area (sq in)	Total Load (lbs)	Load per Bolt (lbs)	Stress (psi)	Proof Strength (psi)	Safety Factor
1	0.61	20000.00	10000.00	16501.65	33000.00	2.00
1-1/8	0.76	20000.00	10000.00	13106.16	33000.00	2.52
1-1/4	0.97	20000.00	10000.00	10319.92	33000.00	3.20
1-1/2	1.16	20000.00	10000.00	8658.01	33000.00	3.81

The correct answer is most nearly, **(A) Two 1" bolts.**