Concept Questions

On material testable for exam #2
Correct answers underlined.
Journal Bearings

How does the torque applied to maintain a constant rotation rate depend on $\mu$ and $c_d$?
(assume full film lubrication with a Newtonian fluid)

1) Linearly proportional to the product
2) Linearly proportional to the ratio
3) Some other dependence
4) I don’t know
Which statement is true regarding the rate of fluid flow past line $A$ and the fluid flow past line $B$?

1) They are essentially the same
2) $A < B$
3) $A > B$
4) I don’t know

$B$

rotation

$A$

$e = \text{eccentricity}$
Which statement is true regarding the rate of fluid flow past line $A$ and the fluid flow past line $B$ due to Couette flow only?

1) They are essentially the same
2) $A < B$
3) $A > B$
4) I don’t know
Concept Question

When the bearing is under load, what is the relative position of the shaft and block?
Preload tension is set at P by pushing alternator up and then tightening this bolt.

Which side of the V-belt is under greater tension?

The side coming onto the driving pulley. In this case the top side which is not usually a good idea.
Cam in the Lawnmower Engine

- This cam arrangement is
  1. Push-rod type
  2. SOHC
  3. DOHC
  4. None of the above
• The following displacement curve is proposed for a cam device

• Sketch the velocity and acceleration curves
Concept Question

The bolts are preloaded to 1000 lbs of tensile stress. When the external load of 1000 lbs is applied, approximately what is the tension in bolt B?

1) 1000 lbs
2) 1500 lbs
3) 900 lbs
4) 500 lbs
Discussion Question:
How can I design a DC motor to provide high stall torque?

\[ \vec{F} = q(\vec{E} + \vec{v} \times \vec{B}) \]

Some answers:
- Stronger magnetic field
- Longer lever arm
- More windings
- Higher voltage applied

Figures removed for copyright reasons.
See http://electronics.howstuffworks.com/motor1.htm
and http://electronics.howstuffworks.com/motor3.htm
Concept Question

As the resistance is increased:
1) **The shaft speed rises monotonically**
2) The shaft speed drops monotonically
3) The shaft speed rises, reaches a maximum, then falls
4) The shaft speed fall, reaches a minimum, then rises

Figure by MIT OCW.
Discussion Question: How do the things I might do to raise stall torque affect back \textit{emf}? 

\[ E = V - R_w i \]

They generally raise the back \textit{emf} too.
Concept Question

http://www.irtools.com/
2141P 3/4" Air Impact Wrench
Weighing just 7 lbs and only 8.2" long, the 2141P is the smallest, lightest 3/4" impact on the market. The composite, ergonomic design is durable and comfortable and the 1200 ft-lbs of max torque will get the job done quickly.

About how much force must the user’s hand apply to the pistol grip during use?
1) 1 lb
2) 10 lbs
3) 100 lbs
4) 1000 lbs

Should be around 1 to resist the moment given the short duration of the impacts, but perhaps about 7 if you include the upward force needed to support the weight.