EML 2322L Quiz 10 (10/29/19)

Answer the following questions based on the information presented in class. You can use your notes but do not speak with others.

What is the equation governing maximum peripheral tool velocity as a function of tool size?
\[ V = \pi \times ____ \times ____ \]

What is the purpose and benefit of peck drilling?
Peck drilling helps chips so they don’t collect inside the hole and cause the drill bit to ________, seize and break.

What is the limiting factor for how fast a drill or endmill can rotate in a particular material?
A. maximum speed of machine spindle
B. type of taper/collet used to hold tool
C. number of flutes on the cutter
D. heat generated in the cutting zone
E. other: ____________________________

What is the limiting factor for how fast a drill or endmill can feed (or advance) thru any material?
A. maximum speed of machine spindle
B. operator courage
C. phase of the moon at that particular hour
D. size / strength of cutting edges / lips
E. other: ____________________________

What is the limiting factor for how deep to cut (per pass) with an endmill in a particular material (assuming sufficient flute length)?
The limiting factor is cutting tool / workpiece / machine (which must resist the cutting forces and subsequent vibrations)

Select six factors that affect optimum cutting speed for drilling and milling:
1. strength & thermal conductivity of material
2. depth of hole
3. presence and efficiency of cutting fluid
4. type, condition & stiffness of cutting machine
5. stiffness of workpiece, fixture and tooling
6. quality of holes desired
7. whether you pay for replacement tools ☺

Based on lecture notes, circle the conditions under which you would use lower cutting speeds:
1. heavy (roughing) / light (finishing) cuts
2. when cutting stronger / weaker materials
3. to minimize / maximize tool life
4. when cutting flexible / rigid workpieces

Calculate the spindle speed [rpm] and feedrate [in/min] for a ½ inch HSS drill bit in mild steel (0.2-0.3 C) when using a manual milling machine:
from Table 1: \[ V \approx _____ \text{ ft/min} \]
\[ N = \frac{12 \text{ in/ft} \times V \text{ ft/min}}{(\pi \times D \text{ in/rev})} \]
\[ N = _____ \text{ rpm} \]

from Table 2: \[ f \approx _____ \text{ in/rev} \]
\[ f = \frac{N \text{ rev/min} \times f_r \text{ in/rev}}{N \text{ rev/min}} \]
\[ f = 764 \text{ rev/min} \times _____ \text{ in/tooth} \times ____ \text{ teeth/rev} \]
scale back 60%: \[ N \approx 460 \text{ rpm}, f \approx 3.7 \text{ in/min} \]

Calculate the spindle speed [rpm] and feedrate [in/min] used when milling an aluminum part with a 1/2 inch diameter, 2 flute HSS endmill on a manual milling machine in lab.
from Table 1: \[ V \approx _____ \text{ ft/min} \]
\[ N = \frac{12 \text{ in/ft} \times V \text{ ft/min}}{(\pi \times D \text{ in/rev})} \]
\[ N = _____ \text{ rpm} \]

from Table 3: \[ f \approx _____ \text{ in/rev} \]
\[ f = \frac{N \text{ rev/min} \times f_i \text{ in/tooth} \times m \text{ teeth/rev}}{N \text{ rev/min}} \]
\[ f = 1910 \text{ rev/min} \times _____ \text{ in/tooth} \times ____ \text{ teeth/rev} \]
scale back 60%: \[ N \approx 1150 \text{ rpm}, f \approx 9.2 \text{ in/min} \]

What size clearance hole would you specify for a mounting bracket that uses M6x1.0 fasteners in (A) aluminum using loose tolerances or (B) steel using more precise tolerances?
A. ____________________________
B. ____________________________