Format of the exam:
34 MC questions
22 from Chapter 29 – 36

How to make the formula sheet
Extra practice problems on web site
I encourage you to study together

Office hour Sunday 6-7 Scott 101
In a double-slit experiment, the two slits are spaced 0.1 mm apart, and a screen is at a distance of 1.0 m. If yellow light with a wavelength of 600 nm is used, what will be the spacing between adjacent bright fringes? (Assume the angle is small.)

a) 6 mm  
b) 12 mm  
c) 60 mm  
d) 1.0 mm  
e) 0.16 mm
The difference in indexes causes a phase shift between the rays.

In Fig. 35-4, assume that two waves of light in air, of wavelength 400 nm, are initially in phase. One travels through a glass layer of index of refraction \( n_1 = 1.60 \) and thickness \( L \). The other travels through an equally thick plastic layer of index of refraction \( n_2 = 1.50 \). (a) What is the smallest value \( L \) should have if the waves are to end up with a phase difference of 5.65 rad? (b) If the waves arrive at some common point with the same amplitude, is their interference fully constructive, fully destructive, intermediate but closer to fully constructive, or intermediate but closer to fully destructive?
Light in air \((n_1 = 1.00)\) passes through a 110-nm-thick optical coating \((n_2 = 1.25)\) before entering a glass camera lens \((n_3 = 1.50)\). For what wavelength (in air) is the reflection from this coated lens minimized?

a) 825 nm  
b) 1100 nm  
c) 275 nm  
d) 550 nm  
e) 137.5 nm
An electromagnetic wave is traveling along the $k$ direction. Which of the following sets are possible directions for the associated electric and magnetic fields at any one instant?

- I: $E$ along $+i$; $B$ along $+j$
- II: $E$ along $-j$; $B$ along $+i$
- III $E$ along $-i$; $B$ along $-j$

a) All three are possible  
b) None of the three is possible  
c) III is possible; I and II are not  
d) I and III are possible; II is not  
e) II and III are possible; I is not
A concave spherical mirror has a focal length $f$. At what position $s$ of the object will the image have magnification $M = -2$?

a) $M = -2$ is not possible.
b) $s = 3f/2$
c) $s = f/3$
d) $s = 3f$
e) $s = -3f/2$
Tom is standing 1m away from a convex spherical mirror with radius 3m. His image is:

a) Virtual, upright, enlarged
b) Real, upright, reduced
c) Virtual, inverted, enlarged
d) Real, inverted, reduced
e) Virtual, upright, reduced
An inductor and a capacitor are connected in series as shown. Initially the capacitor is charged with a charge \( q = Q_m \). The switch is then closed. How much charge is on the capacitor when the energy is shared equally between the inductor and the capacitor?

a) \( Q_m LC \)
b) \( Q_m / \sqrt{LC} \)
c) \( Q_m / (LC) \)
d) \( Q_m / \sqrt{2} \)
e) \( Q_m \sqrt{LC} \)
The current in a solenoid increases steadily from 0 to 10 mA in 40 ms. If the induced emf across the solenoid is 0.8 mV, what is the solenoid’s inductance?

a) 0.2 mH  
b) 3.2 mH  
c) 8.0 mH  
d) 0.8 mH  
e) Cannot be determined from the information given
Two concentric, circular loops of wire lie in the plane of the paper. The outer loop carries a current $I$. Pick the correct answer.

a) If $I$ is clockwise and constant, the induced current in the inner loop will be counterclockwise.
b) If $I$ is clockwise and increasing, the induced current in the inner loop will be clockwise.
c) If $I$ is counterclockwise and decreasing, the induced current in the inner loop will be counterclockwise.
d) If $I$ is clockwise and decreasing, the induced current in the inner loop will be zero.
e) If $I$ is counterclockwise and constant, the induced current in the inner loop will be counterclockwise.
A rectangular loop of wire of dimensions $a$ and $b$ is being pulled with speed $v$ out of a region of uniform magnetic field $B$ that is directed into the paper. If the loop has a resistance $R$, what is the induced current in it, when it is partially out of the field region, as shown in the picture?

a) $Bav/R$, counterclockwise
b) $Bbv/R$, clockwise
c) $Bav/R$, clockwise
d) $Bbv/R$, counterclockwise
e) Zero
In the $LR$ circuit below, the current builds up to one-quarter of its steady (final) value in 2 seconds after the switch is closed. What is the time constant for this circuit?

- a) 0.58 sec
- b) 8.0 sec
- c) 2.8 sec
- d) 1.4 sec
- e) 7 sec