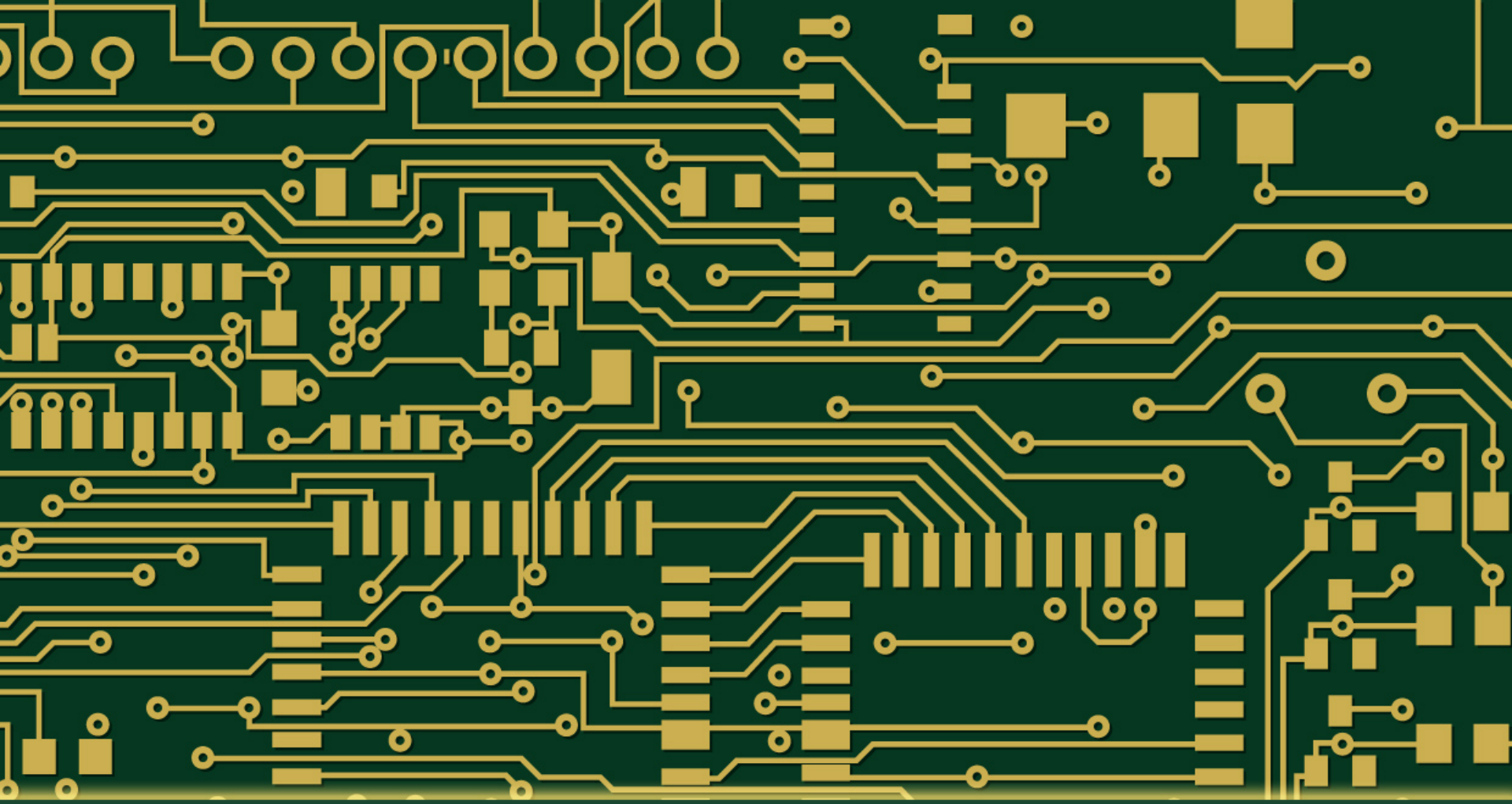
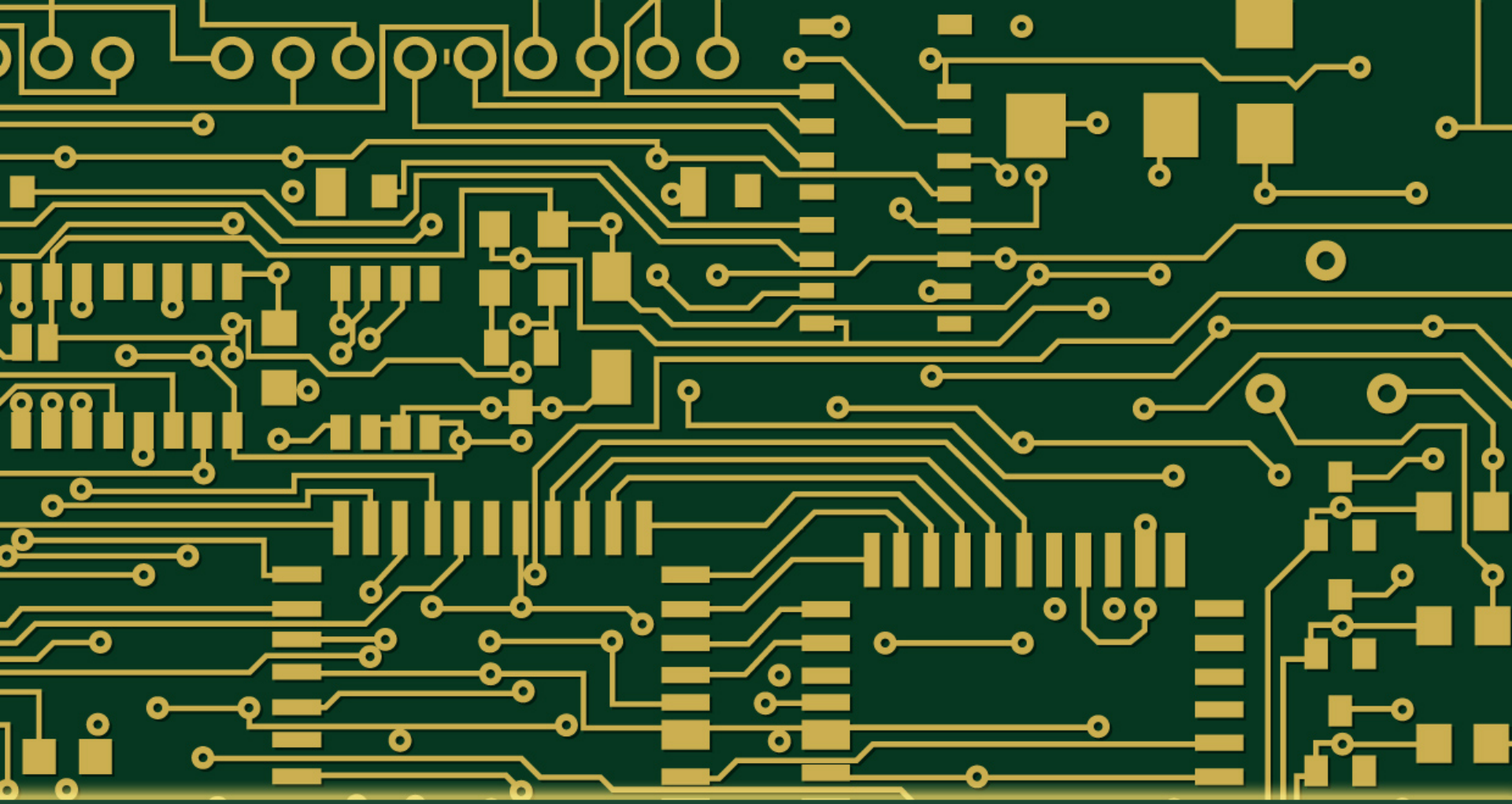
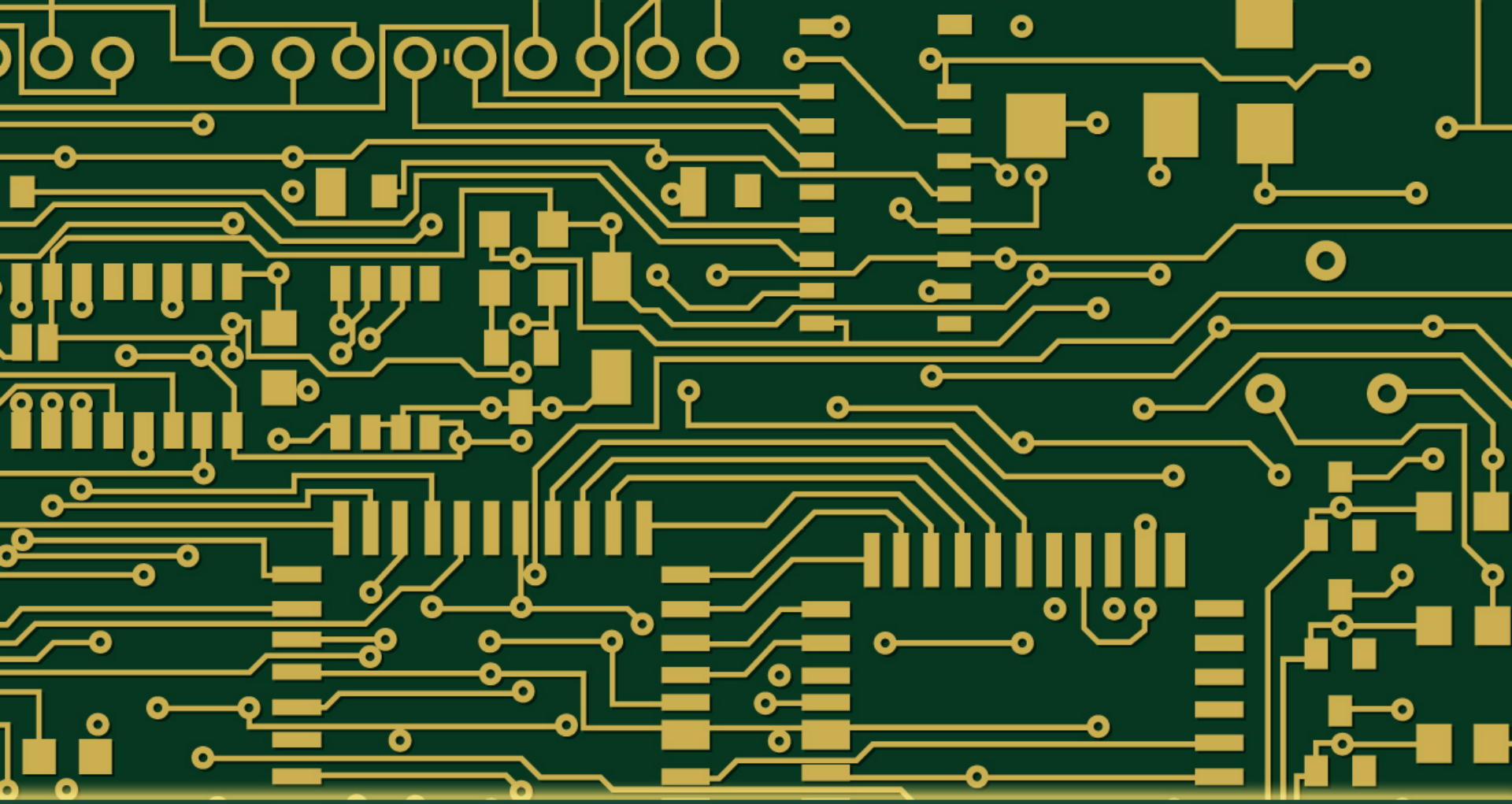


Circuit Analysis-II



Revision



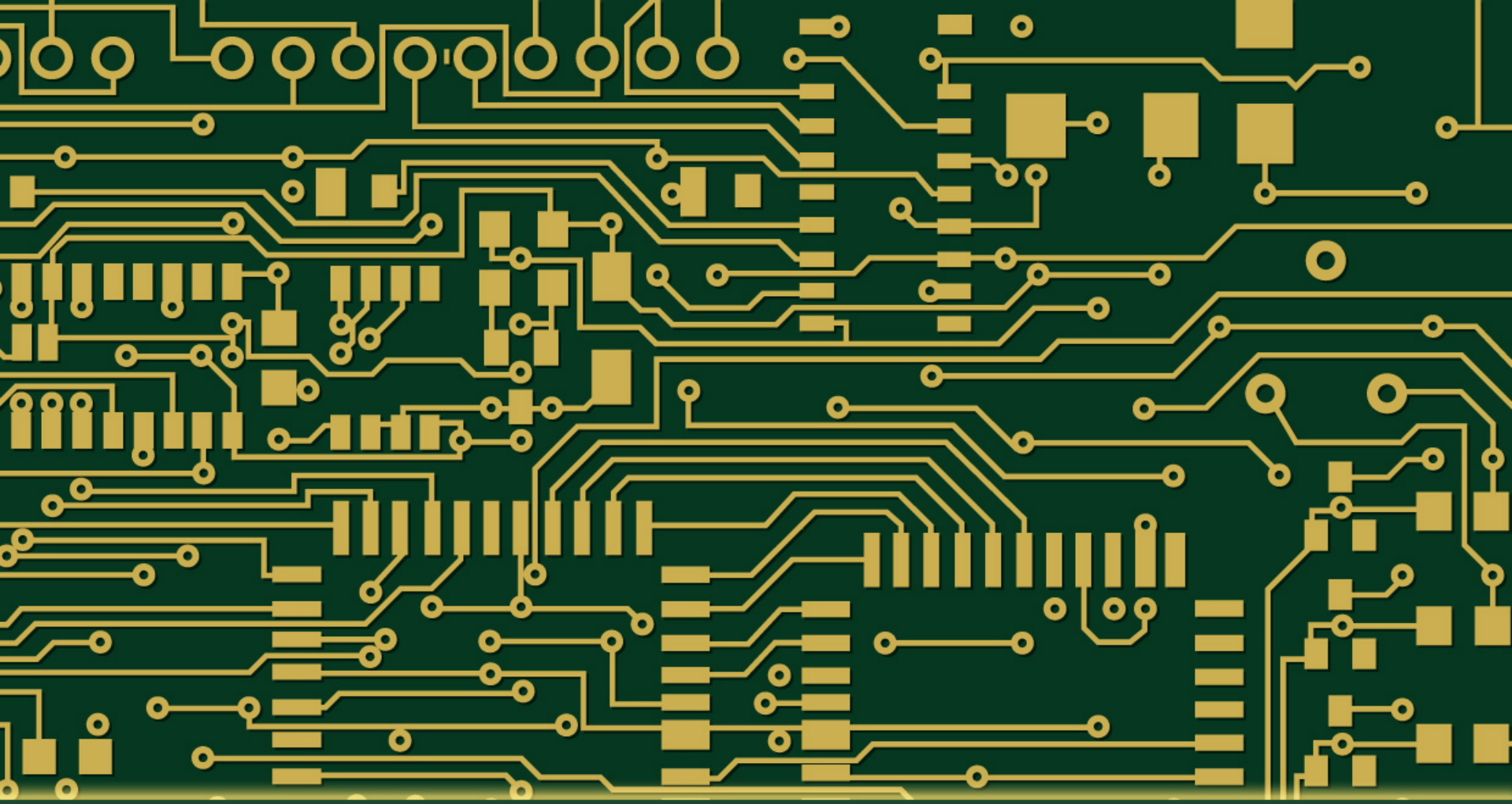
Sinusoidal Waveforms

Problem #1

- ✓ Calculate the period of each of the following values of frequency:
  - ✓ (a): 60 Hz
  - ✓ (b): 1 kHz

Problem #2

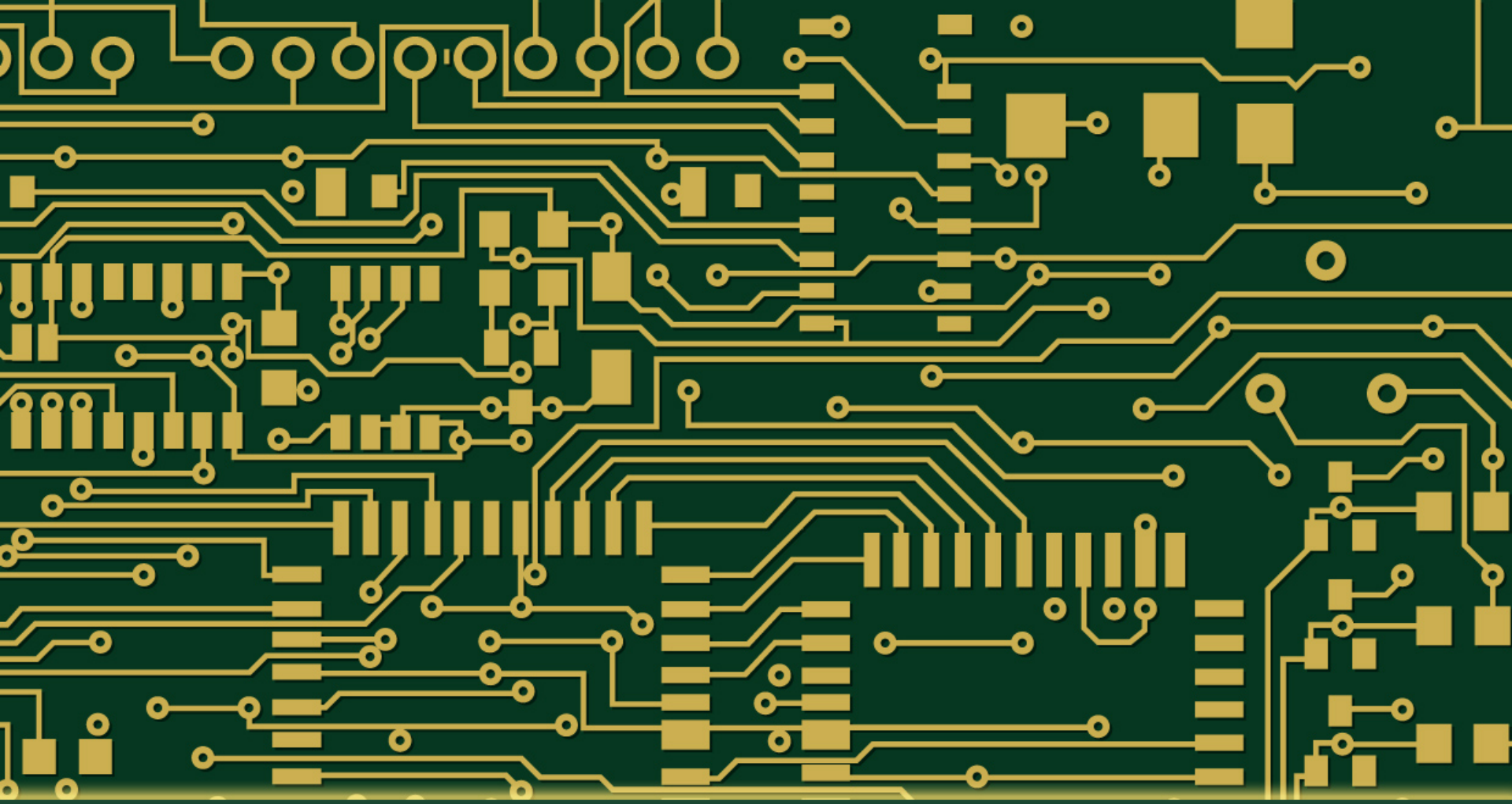
- ✓ At what speed of rotation must a four-pole generator be operated to produce a 400 Hz sinusoidal voltage?



Sinusoidal Voltage & Current Values

Problem #3

- ✓ A sine wave has a peak value of 12V. Determine the following values:
  - ✓ Peak-to-Peak
  - ✓ Average



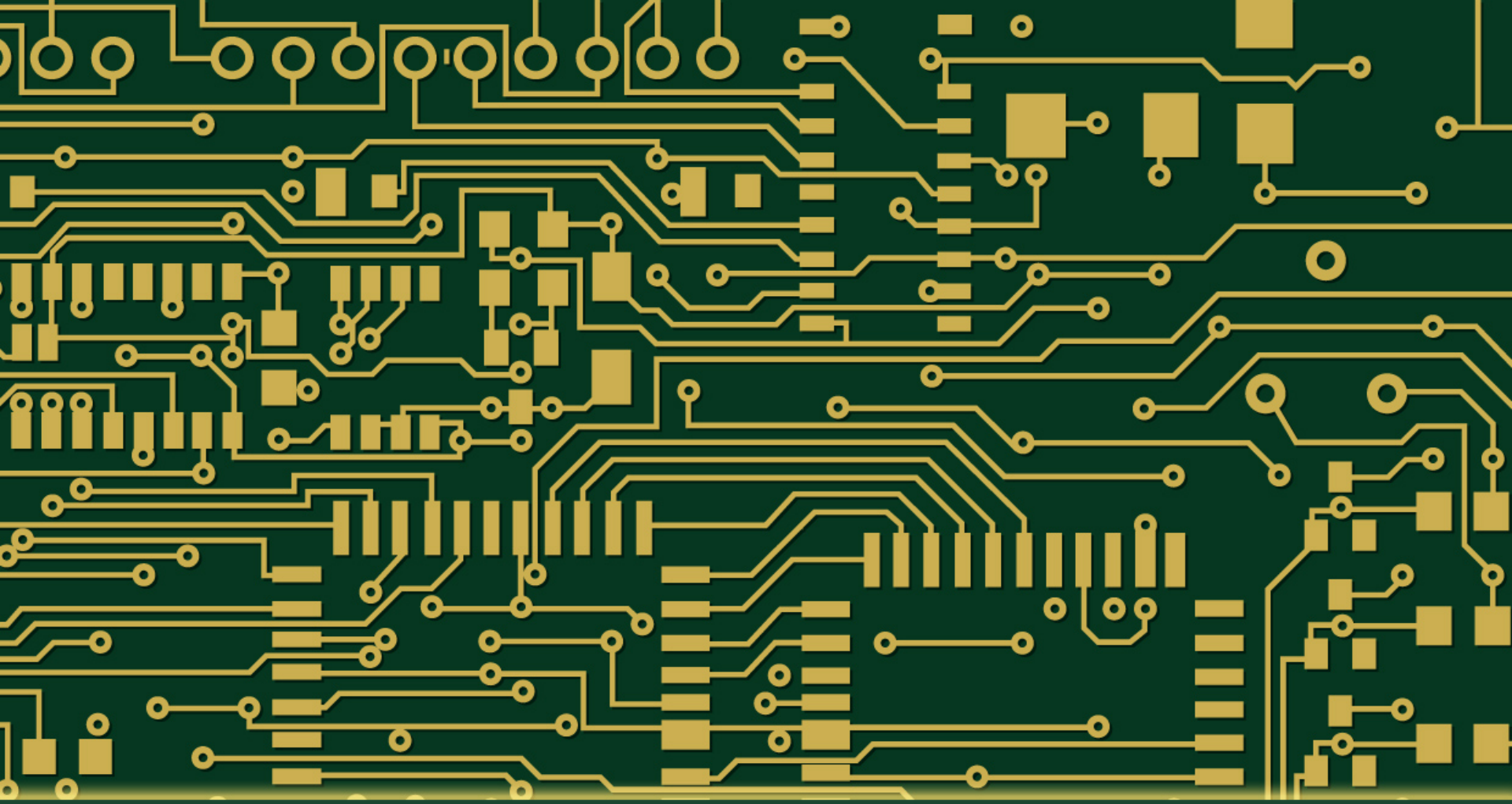
Angular Measurement & Phase

Problem #4

- Convert the following angular values from degrees to radians:
  - 45 °
  - 135°

Problem #5

- ✓ Make a sketch of two sine waves as follows: Sine wave A is the reference, and sine wave B lags A by 90°. Both have equal amplitudes.



Sinusoidal Formula

Problem #6

- For a particular 0° reference sinusoidal current, the peak value is 100 mA. Determine the instantaneous value at each of the following points:
  - 35°
  - 95°

Problem #7

- A current source in a linear circuit has:

$$i_s = 15\cos\left(25\pi t + 25^\circ\right) A$$

  - (a): What is the amplitude of the current?
  - (b): What is the angular frequency?
  - (c): Find the frequency of the current.
  - (d): Calculate i_s at t = 2ms.

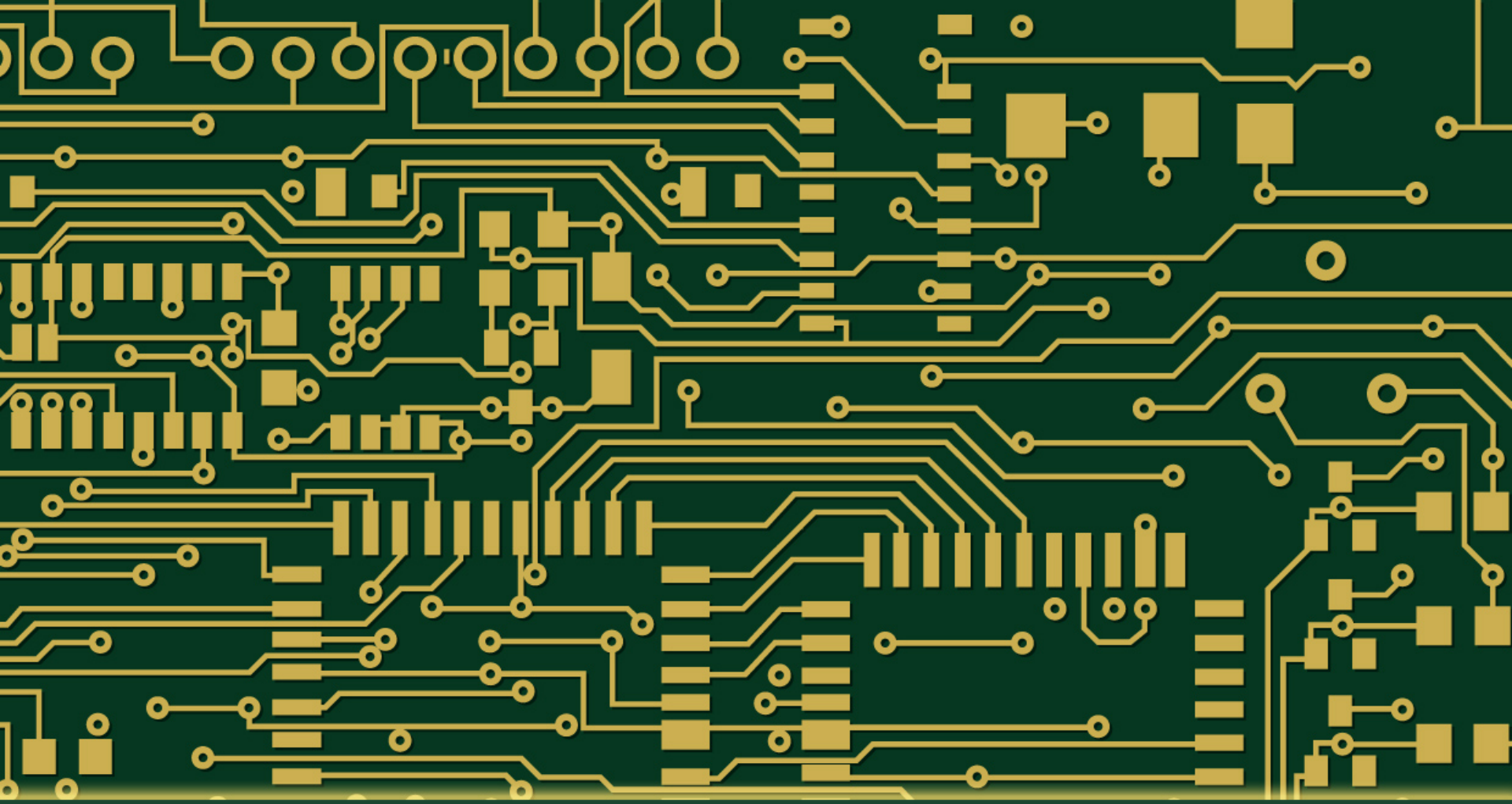
Problem #8

- ✓ For the following pair of sinusoid determine which one leads and by how much?

$$v_1(t) = 4\cos\left(377t + 10^\circ\right)V$$

and

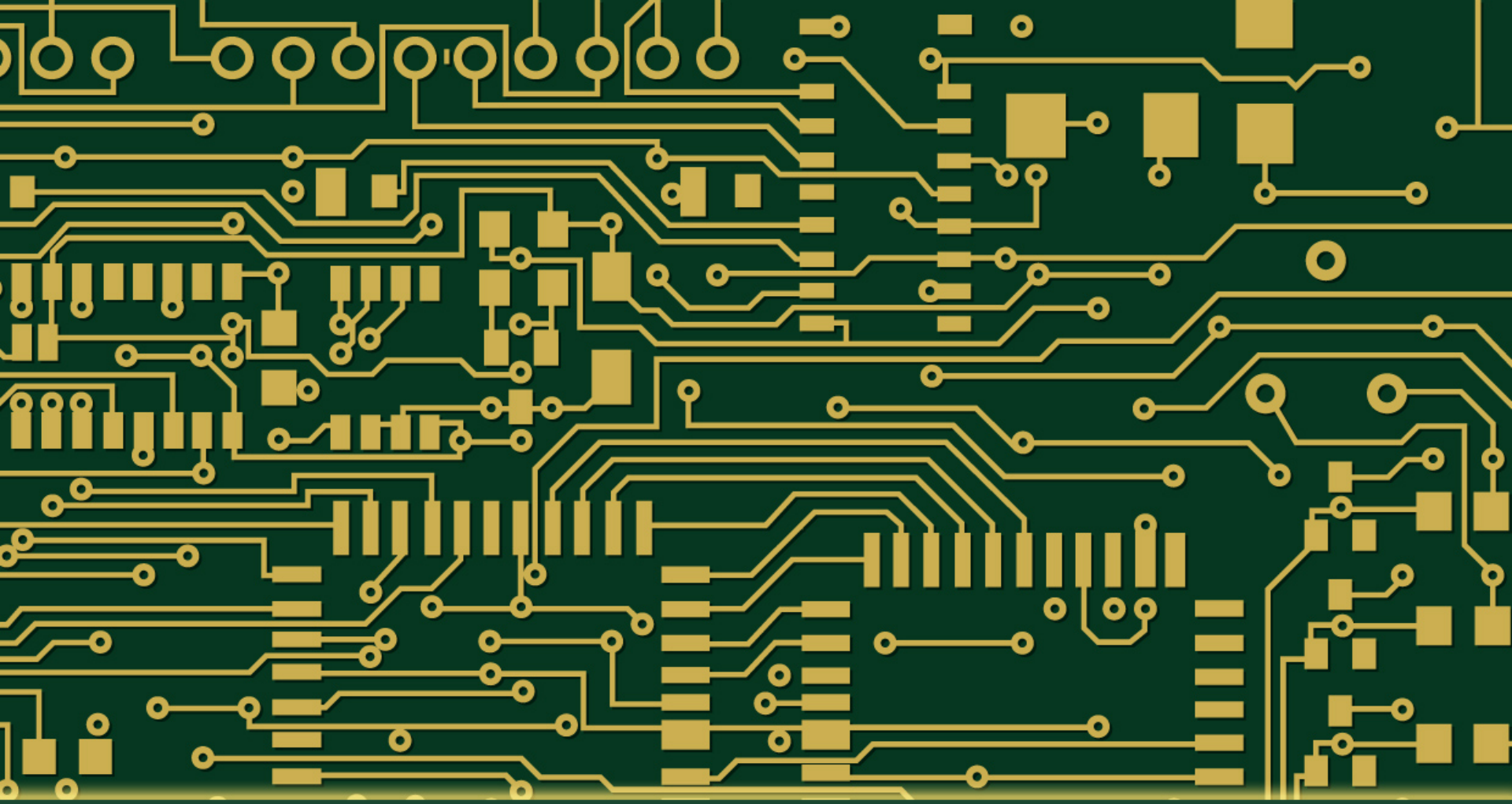
$$v_2(t) = -20\cos\left(377t\right)V$$



Signal Conversions

Problem #9

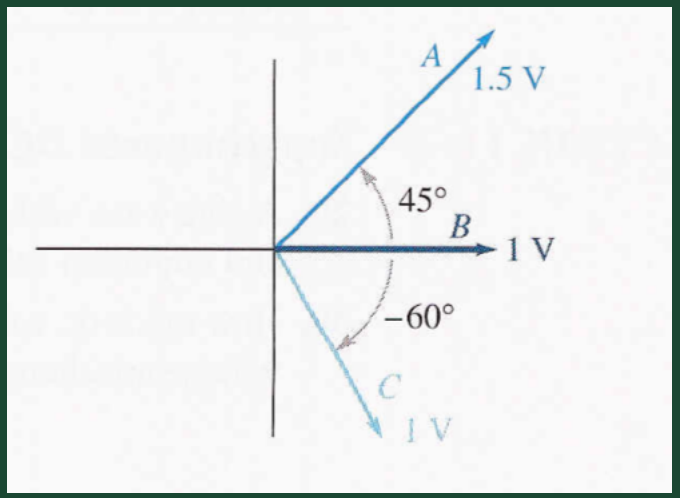
- ✓ (a): Express the following function in cosine form:
  - ✓ -9 sin (8t)
- ✓ (b): Express the following function in sine form:
  - ✓ -10 cos (ωt + 50°)



Phasors

Problem #10

- ✓ Draw the sine waves represented by the phasor diagram shown below. The phasor lengths represent peak values.



Problem #11

- ✓ If $f(\Phi) = \cos\Phi + j\sin\Phi$, show that $f(\Phi) = e^{j\Phi}$.

Problem #12

- ✓ Find the Phasors corresponding to the following signals:
  - ✓ (a): $v(t) = 21 \cos(4t - 15°)$ V
  - ✓ (b): $i(t) = -8 \sin(10t + 70°)$ mA

Problem #13

- ✓ Let **X** = 4 $\angle 40°$ and **Y** =20 $\angle -30°$. Evaluate (**X** + **Y**) / **X** and express your result in polar form.

Problem #14

- ✓ Simplify the following expressions:

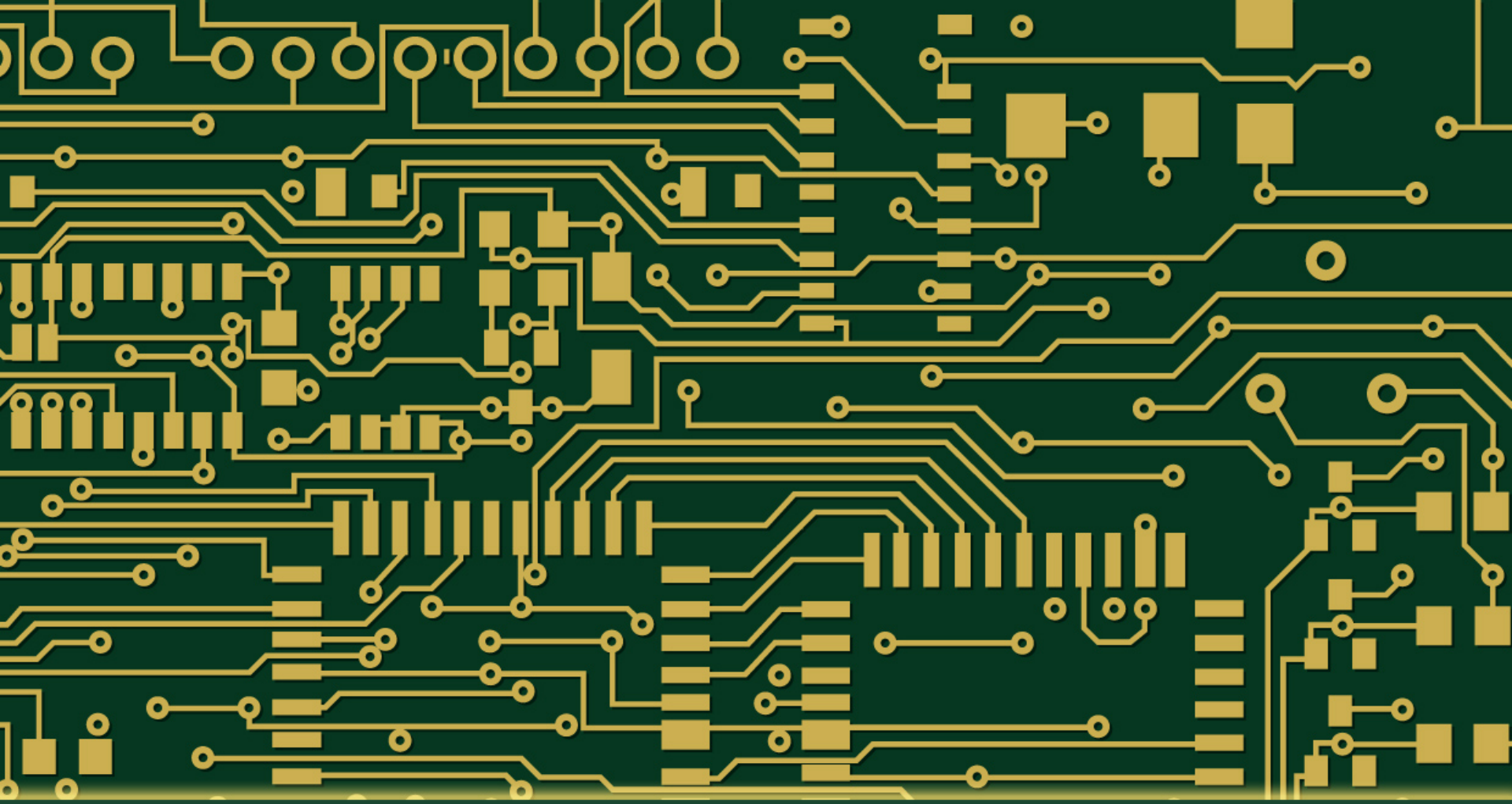
$$\frac{2+j3}{1-j6}+\frac{7-j8}{-5+j11}$$

Problem #15

- ✓ Two voltages v_1 and v_2 appear in series so that their sum is $v = v_1 + v_2$. If $v_1 = 10 \cos (50t - \pi/3)$ V and $v_2 = 12 \cos (50t + 30°)$V, find v.

Problem #16

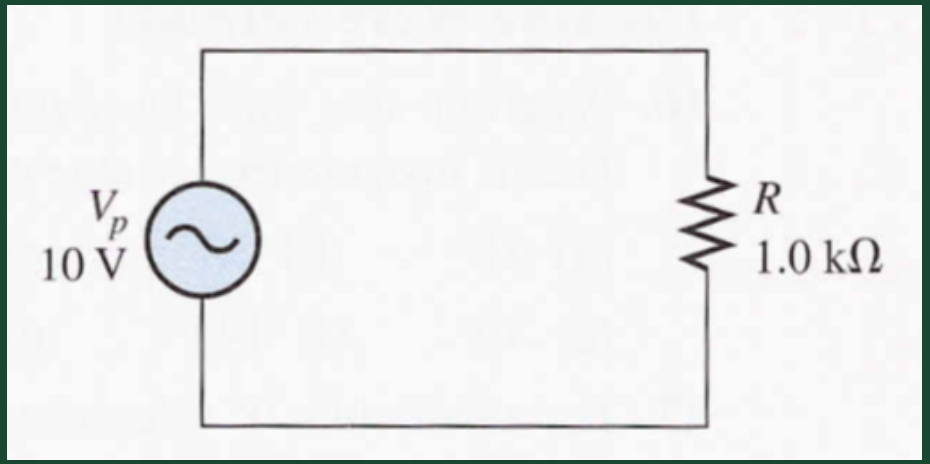
- Obtain the sinusoids corresponding to each of the following Phasors:
  - (a): $\bar{V} = 60\angle 15^\circ V, \omega = 1$
  - (b): $\bar{I} = 2.8e^{-j\pi/3} A, \omega = 377$

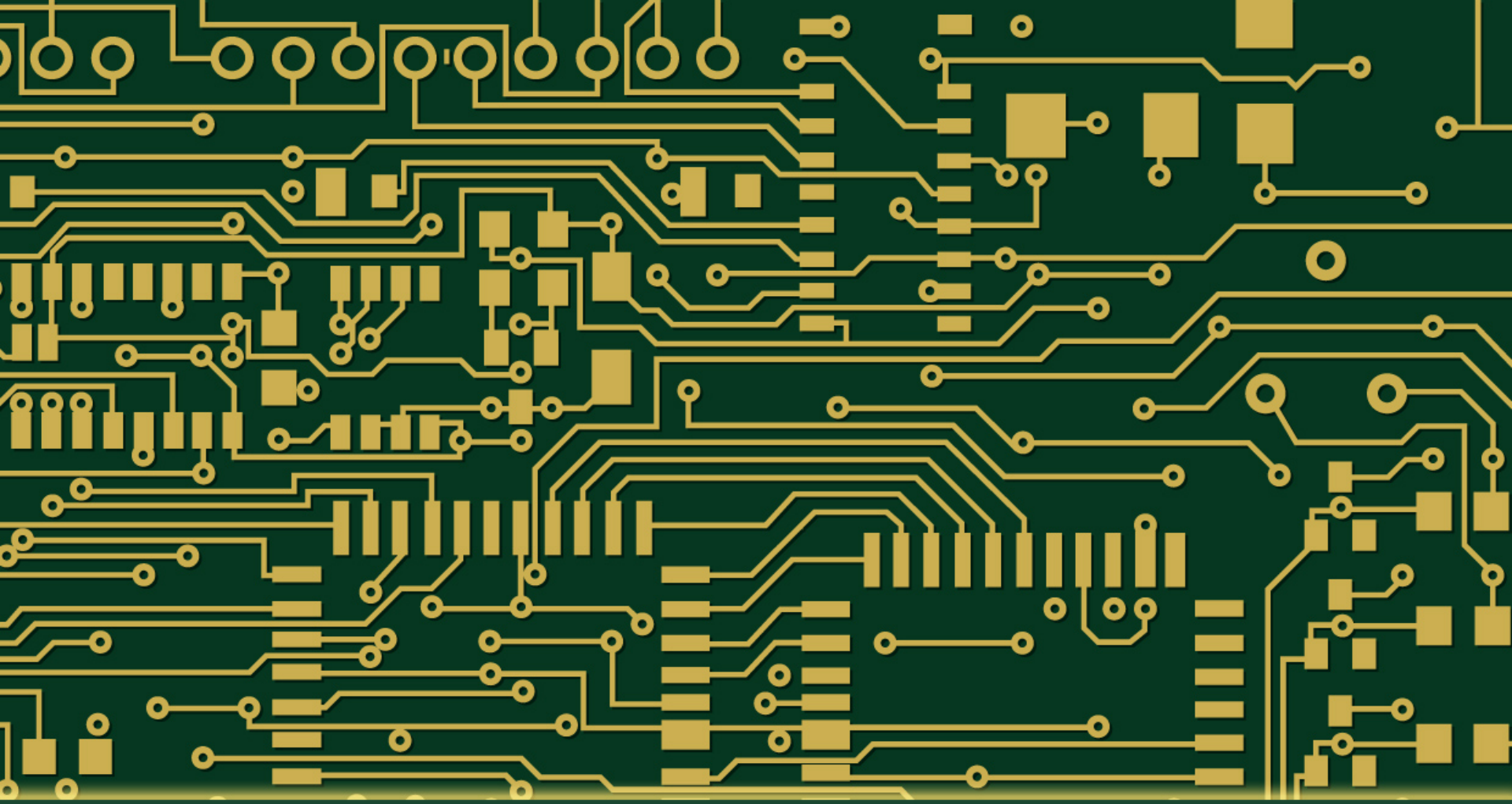


Analysis of AC Circuit

Problem #17

- ✓ A sinusoidal voltage is applied to the resistive circuit shown below. Determine the following:
  - ✓ (a): I_{rms}
  - ✓ (b): I_{avg}
  - ✓ (c): I_{pp}





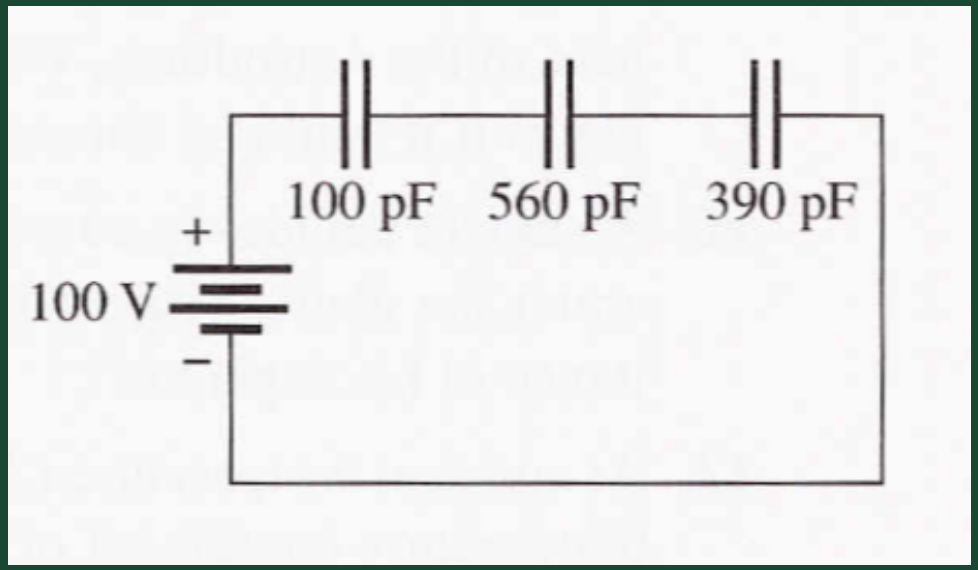
Capacitors

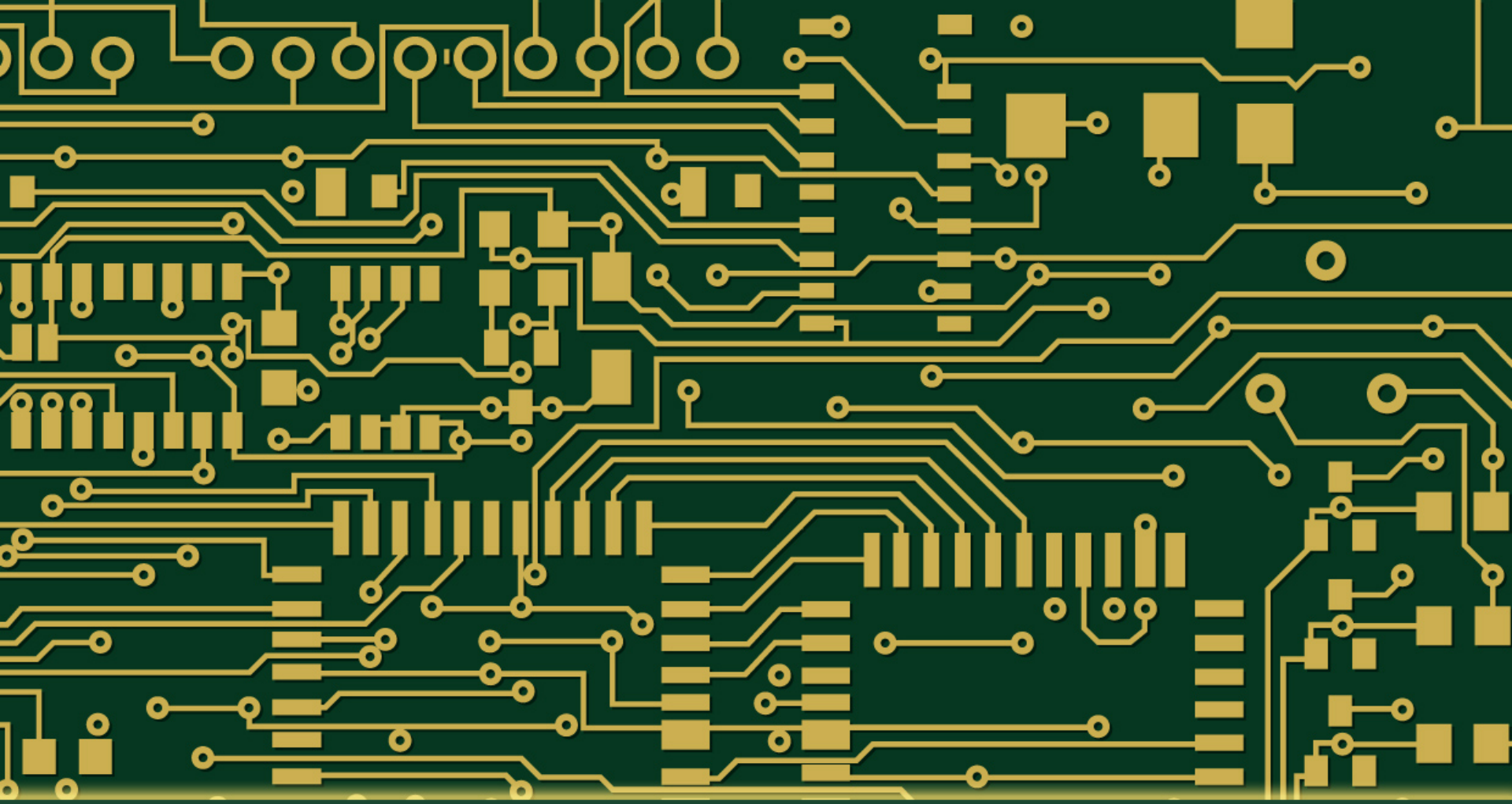
Problem #18

- ✓ (a): Find the capacitance when Q = 50 μC and V = 10V.
- ✓ (b): find the charge when C = 0.001 μF and V = 1kV.

Problem #19

- ✓ For the circuit shown below, determine the voltage across each capacitor:

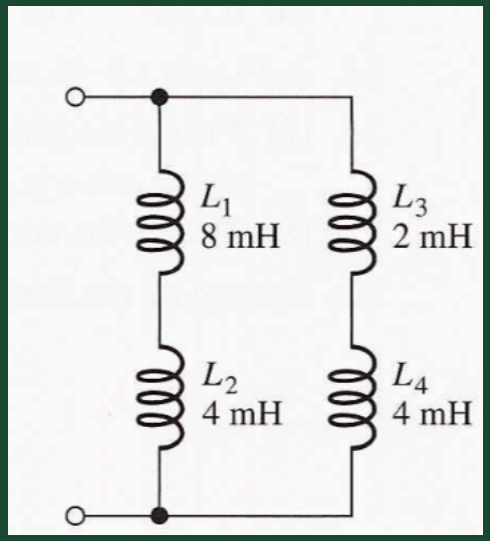


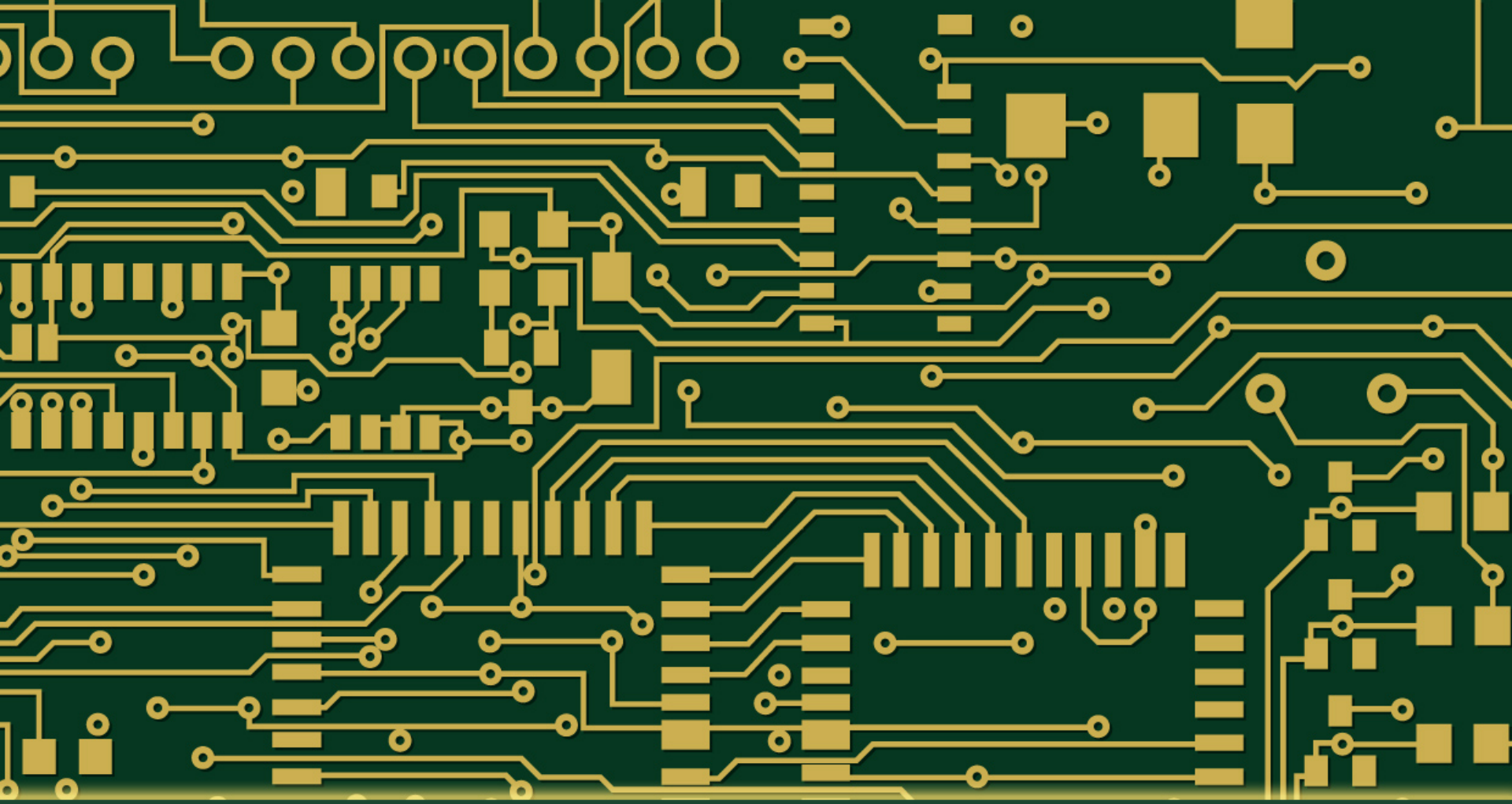


Inductors

Problem #20

- ✓ What frequency will produce 500 mA total rms current in the following circuit with an rms input voltage of 10 V?





Thank You