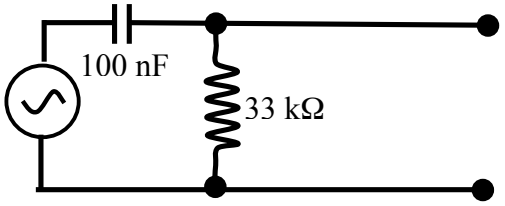
# P214 Final Practice Problems

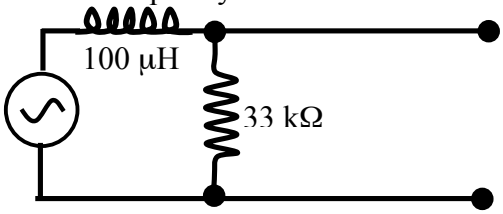
1. A sinusoidal waveform is displayed on an oscilloscope and has a peak-to-peak amplitude of 15 V. At the same time, the signal is measured on a multimeter which is set to measure AC voltage. What value would you expect to be displayed on the multimeter?

2. A pair of terminals is investigated by measuring the output voltage when connected to two different loads. When a resistance of 12 Ω is connected across the output, the output voltage is 16 V, and when a load of 48 Ω is connected, the output voltage is 32 V. Determine the Thevenin and the Norton equivalents of the circuit behind the terminals.

3. Calculate the time constant $\tau$ and the cut-off angular frequency $\omega$ of the following circuit. Is it a high- or low-frequency cut-off?




4. Calculate the time constant $\tau$ and the cut-off angular frequency $\omega$ of the following circuit. Is it a high- or low-frequency cut-off?




5. Design a logic circuit to take 3 inputs – A, B, and C – and produce a single output X, such that X is true if, and only if, precisely two of its inputs are true.

6. Bugg problem 13.9.4

7. Using 2-input gates, show how to make (a) a NOT inverter from a NOR gate, (b) an OR gate from NOR gates, and (c) an OR gate from NAND gates. Also show how to make (d) a 3-input AND from 2-input ANDs, (e) a 3-input OR from 2-input ORs, and (f) a 3-input AND from 2-input NANDs.

8. Implement the following expressions using standard logic gates, and draw the resulting circuits: (a) $X = \overline{(A + B)} \cdot C$ , (b) $Y = A\overline{B}C + \overline{A}D + C\overline{D}$ (dots are omitted in the ANDs in this expression, as you see sometimes), (c) $Z = (A \cdot B) + \overline{(C + D)}$.

9. Switch bounce is an issue you sometimes see with electro-mechanical switches – when the switch is switched, for a millisecond or two there will be oscillations where the switch loses contact or switches back (before the switch settles down after a couple of milliseconds). Design a sequential

logic circuit using two input NOR gates to remove the effects of switch bounds from an electro-mechanical logic switch.

10. Essentially all the Bugg problems that we didn't have as homework, but are in the Bugg chapters that we did cover, would be good practice problems for the final. (And the ones that you did have as homework are of course good too, but you've already done those as homework.)