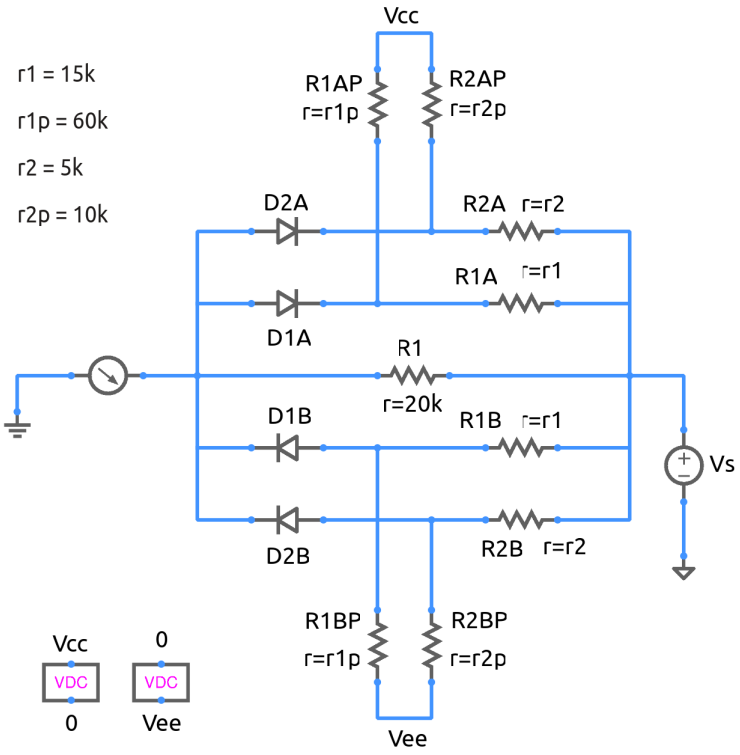
ee101_diode_circuit_10.sqproj



The diode/resistor network shown in the figure can be used (along with an Op Amp) to convert a triangular input voltage into a (nearly) sinusoidal output voltage. The purpose of this exercise is to understand the functioning of the diode/resistor network. The complete circuit, which includes an Op Amp, will be included in another simulation example (`ee101_wave_shaper.sqproj`).

Consider the applied voltage (from source `Vs`) to be positive. When the voltage is sufficiently small, none of the diodes conduct, and the current I is simply V_s/R_1 (where I is the current measured by the ammeter).

As the source voltage increases, the voltage across diode `D1B` increases, and at some point, it turns on. As that happens, the slope of the I-V_s relation changes. As the source voltage increases further, diode `D2B` also turns on, changing the slope once again.

Similar changes happen when a negative V_s is applied.

Exercise Set

1. Calculate the input voltage values at which diodes `D1B` and `D2B` are expected to turn on. Verify your values by running the simulation and plotting I_{D1B}, I_{D2B} versus V_s.

2. Keeping only the diode(s) which are conducting, calculate the slope of the I-V_s relation in each region. Check against simulation results.

3. If we replace the DC voltage source `Vs` with a triangular input voltage, the current measured by the ammeter would be approximately sinusoidal. How would you convert this current into a voltage?