

## Lab 7: Transistor Applications

### 1. Transistor Switch (30 minutes)

Construct a voltage controlled transistor switch by connecting the collector of a 2N3904 transistor through a light bulb to a 6 V power supply (see design exercise 6-2). Use a square wave voltage to control the switch. Measure the voltage across the light bulb and compare with your quantitative and qualitative results from lab exercise 4-1 (if necessary repeat lab exercise 4-1).

### 2. DC-biased AC transistor amplifier (2 hours)

a. Design and construct a common-emitter amplifier with a quiescent current  $I_C = 0.2$  mA, and a gain of  $\sim 15$  at 2 kHz, powered by a +15 V power supply. Measure the small-signal AC gain, and compare it to your calculation. Measure the voltage swing (i.e. the maximum output voltage swing before distortion). Measure the output impedance (Suggestion: use AC coupling).

b. Short your emitter resistor to obtain the maximum gain. Measure the new small-signal gain. It will be necessary to change your bias network. Does this agree with your expectations? Measure the new voltage swing. Measure and describe any distortion.

c. Return to your common-emitter amplifier with a gain of 15. Now try to eliminate the emitter resistor without affecting the DC bias, by using a by-pass capacitor parallel to the emitter resistor. Measure the new small-signal gain. Measure and describe any distortion.

