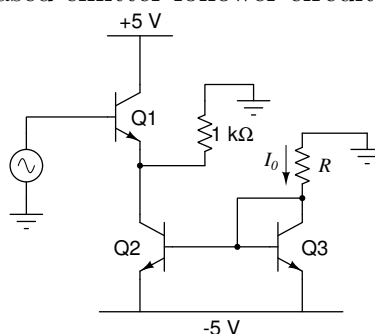# Indian Institute of Technology, Delhi
ELL304 Analog Circuits
Laboratory Exercise 4, 3 September 2015

Aim: To design a current-biased emitter follower circuit.

Design:

1. Design a current mirror circuit with $I_0 = 1$ mA, $r_o = 100$ kΩ. Assume that the early voltage of the given transistor is 100 V, and β is 200. Choose an appropriate value for the resistor.

2. Design a common-collector stage to obtain an input resistance of more than 100 kΩ, and an output resistance of less than 30 Ω.

Measurements and calculations: The following parameters are to be measured based on the values given:

1. Current mirror ratio of the current source.

2. Input and output resistance of the common-collector stage compared with the calculated values.

3. Voltage gain of the common-collector circuit.

Design equations: 1.

$$I_{C2} = I_0 = \frac{|V_{EE}| - V_{BE_2}}{R}$$

2.

$$r_o = \frac{V_A}{I_{CQ}} \qquad r_\pi = \frac{v_T}{I_{CQ}/\beta}$$

3.

$$R_{in} = r_{\pi_1} + (1 + \beta)(r_{o2} \parallel R_L)$$

4.

$$R_{out} = r_{o2} \parallel (r_{\pi_1}/(1 + \beta))$$