**Nanyang Technological University**
**School of Electrical & Electronic Engineering**
**EE2002 Analog Electronics – Tutorial 10**

1. What are the output currents and output resistances for the current sources in Figure 1, if $I_{REF}$ = 100 μA, $\beta$ = 50 and $V_A$ = 50 V?
   (Ans: *216.57μA, 277kΩ; 418.7μA, 138.5kΩ; 895.1μA, 69.2kΩ*)

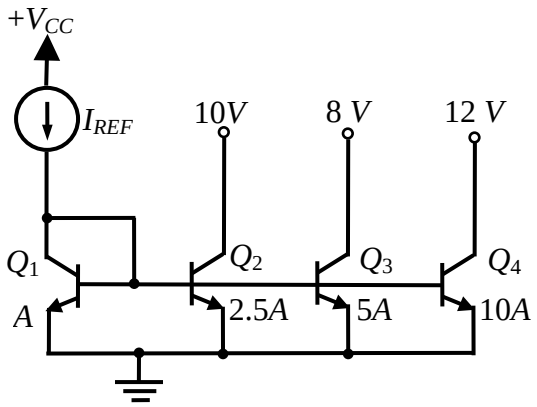


**Figure 1**

2. Find the output current in the current source of Figure 2 if $A_{E3}$= 10$A_{E4}$, $A_{E2}$= 10$A_{E1}$ and R= 1kΩ. Here $A_{EX}$ refers to the emitter area of transistor QX. Assume infinite current gain of the transistors (β→∞) and ignore Early effect.
   (Ans: *115μA*)

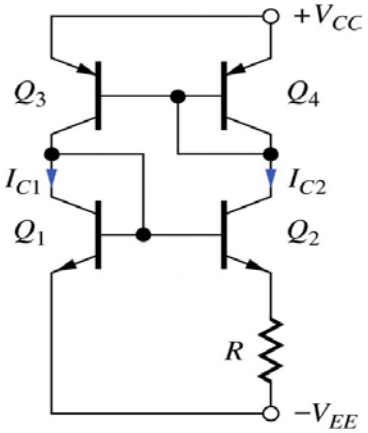


**Figure 2**