1. (40 points) The logic shown above uses two edge-triggered $D$-type flip flops. The clock input is a 1.0 MHz square wave.

   (a) Show the complete state diagram $Q_1Q_0$.
   (b) Find the frequency of the pulses at $Q_1$.
   (c) What fraction of the time is $Q_1$ a logical “1”? 

2. (30 points) The circuit shown uses complementary MOS devices as a logic gate.

   (a) Make a truth table showing the status ($ON$ or $OFF$) of each transistor $Q_1$ through $Q_6$, and the output state $F$, as a function of logic inputs $A$ and $B$. 

(b) What is the logical relationship between $F$ and $A$ and $B$, e.g. NAND, NOT A, etc.

3. The circuit above uses a bipolar junction transistor with a $\beta$ of 100.
   
   (a) Is the transistor cut off, saturated, active, or reversed?
   
   (b) Find the current flowing in to the collector of the transistor.