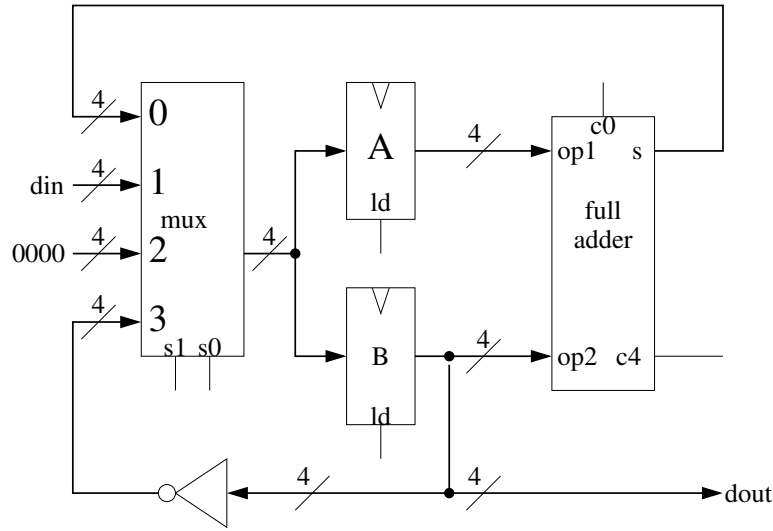# Sample Sequential Circuit Questions

1. Consider the following logic diagram of a sequential system:
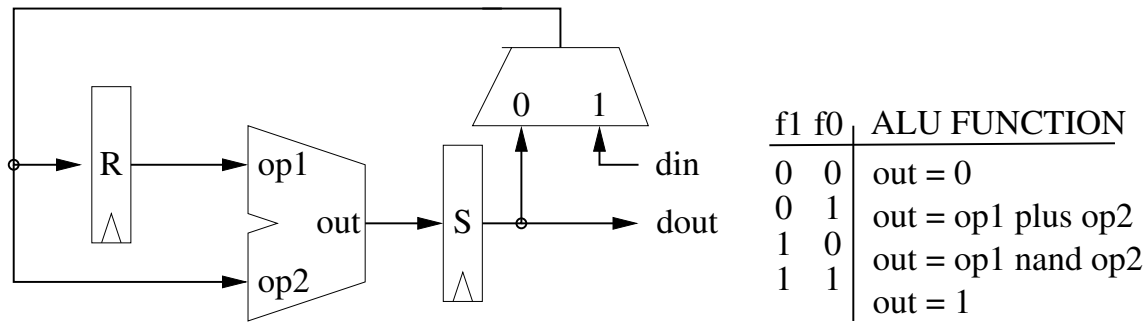

(a) On the diagram, label all the control inputs only.

(b) Propose a control word format for this system, indicating which control inputs are defined by which bit positions.

(c) For each of the following tasks determine if it can be performed by a single μ-instruction; that is, by a single control word assignment. If it can, then give the control word that will cause the task to be executed, using your control word format from question (b).

   i. **B $\leftarrow$ A plus B**

   ii. **A $\leftarrow$ 0**

   iii. **A $\leftarrow$ B$'$**

   iv. **B $\leftarrow$ $-$B**

(d) Without using data input port 1 of the MUX, Find a sequence of μ-instructions, expressed as register transfer statements, that enable the sequential system to perform the following tasks:
   HINT: How is the functional specification of an n-bit Full Adder expressed?

   i. **A $\leftarrow$ 1**

   ii. **A $\leftarrow$ -1**

2. A digital system is implemented by the following logic diagram:

f1 f0	ALU FUNCTION
0 0	out = 0
0 1	out = op1 plus op2
1 0	out = op1 nand op2
1 1	out = 1

R and S are storage registers.

(a) On the logic diagram assign and label the control inputs to all devices as required.

(b) Which of the following register transfer statements are μ-instructions? For those that are, indicate what values the control inputs must have to achieve the desired effect. For those that are not, give a sequence of μ-instructions that will result in the desired effect.

    i. S ← 1

    ii. S ← R plus 1

    iii. S ← −1