Sheet 1, Revision on Basic Concepts

1. Design a circuit which executes the following code:
   If (A+B > 14) Then
         S = C + D + 1
   Else
         S = C + D

   A, B, C and D are 4-bit binary numbers! You can use the following components:
   • Adder
   • Comparator
   • Subtractor
   • Multiplexer
   • Counter
   <u>HINT:</u> There is a tricky solution to this problem which uses just adders. If you achieve designing this circuit using only 4-bit adders you are intelligent.

2. For the following schematic, Ripple Carry wiring, use a, b, e and f all as four ones. e.g. a <= "1111" etc.
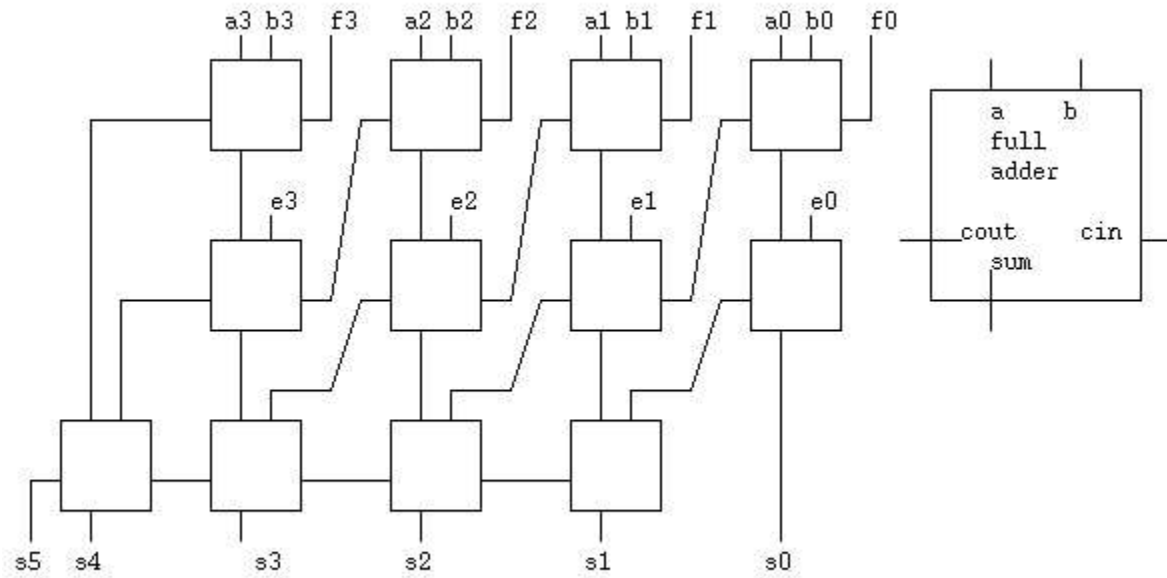   a) what is the six bit result s.
   b) given that the time from any input to any output in the full adder is 3T, how much time does the longest path require?
   The answer is _____ T
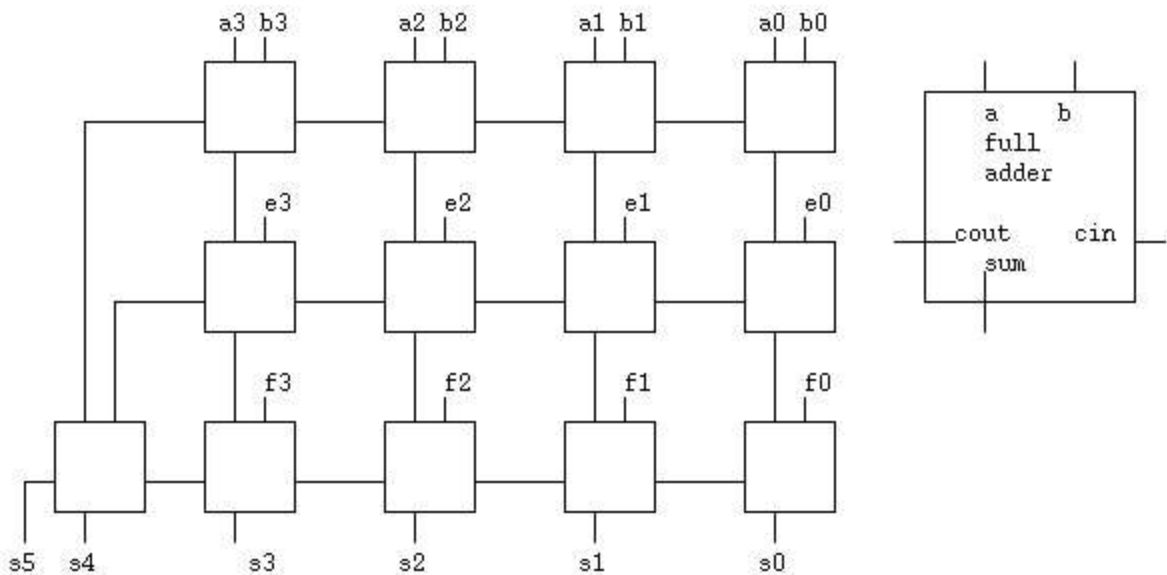
Ripple Carry wiring

3. For the following schematic, Carry Save wiring, use a, b, e and f all as four ones. e.g. a <= "1111" etc.
   a) what is the six bit result s.
   b) given that the time from any input to any output in the full adder is 3T, how much time does the longest
      path require?
   The answer is _____ T


```
      a3 b3   f3    a2 b2   f2    a1 b1   f1    a0 b0   f0
                                                                          a      b
                                                                          full
                                                                          adder
         e3             e2             e1             e0
                                                                       cout      cin
                                                                        sum

   s5   s4             s3             s2             s1             s0
        Carry Save wiring
```

4. Choose the right answer

   a. A digital circuit designed to detect the presence of a particular digital state is called:
      A. Multiplexer   B. Decoder   C. Parity Generator   D. Encoder

   b. A circuit that generates a binary code at its outputs in response to one or more active input lines.
      A. Encoder   B. Decoder   C. Demultiplexer   D. Shift-Register

   c. A circuit that uses a binary decoder to direct a digital signal from a single source to one of several destinations.
      A. Decoder   B. Multiplexer   C. Demultiplexer   D. Parity Generator

5. Explain about setup time and hold time, what will happen if there is setup time and hold time violation, how to overcome this?

6. What is difference between latch and flipflop?

7. Tell some of applications of buffer?

8. How do we know, if given a circuit, whether it is a Combinational Circuit or a Sequential Circuit?

9. Why do we have to identify the type of circuit? Does it really matter?

10. Show on a timing diagram an explanation of the timing parameters of a flip flop (t_{hold}, t_{setup}, t_{cq})