Digital Circuits and Systems

Mid Semester Exam-II

Date: 1st October 2014 Time: 60 Minutes Max Marks. 15

Notes: All questions are compulsory.
Marks of each question are mention against it.
Assumptions made should be written clearly.

1: Consider number A of X bits stored in sign magnitude as shown in the figure 1 below (most significant bit is the sign, remaining X-1 bits magnitude). We want to multiply A with 2. Design the digital circuit that can inform us (by turning a light on) if the result could still be stored in the X-1 bits (i.e., no overflow would result). You can assume that in your design you may use "wires" connected directly to the bit locations. Use the MINIMUM number of gates. **[5]**
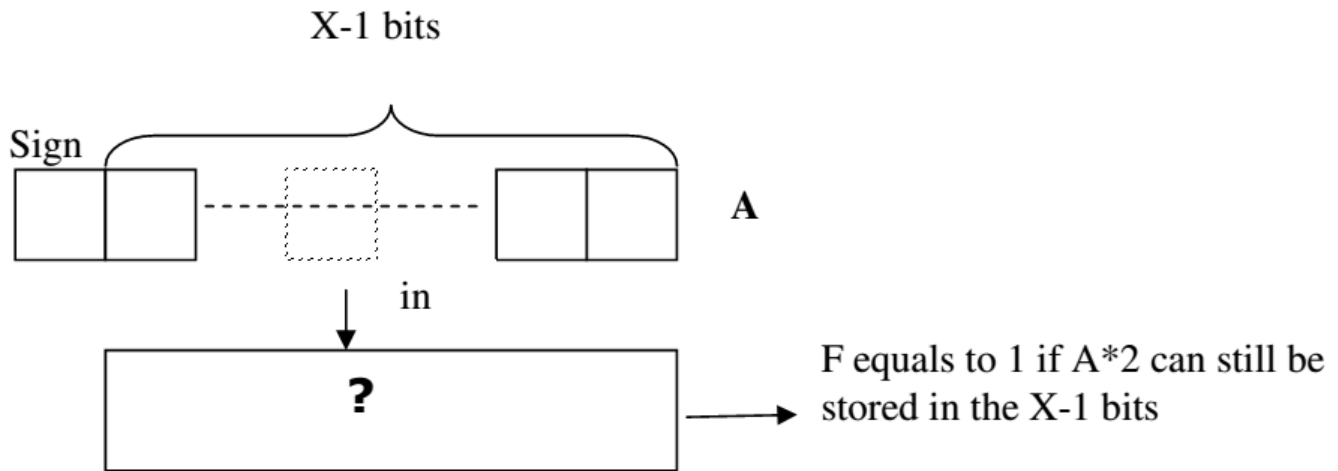
Figure 1

2: Obtain the minimal Sum of Products expression for function F(A, B, C, D) = $\sum$(4, 5, 6, 7, 8, 9, 10, 11) using Quine McCleskey method. **[5]**

3: Design a counter that uses JK flip flops and goes through the following repeated sequence: 0, 1, 2, 4, 5. (Treat the unused states as don't care conditions).
a. Show the state diagram
b. Design the circuit using the minimum number of 2-input gates.
d. If by mistake (e.g., interference) your circuit jumps to number 3, is it still going to work? Explain. (*Hint: show what happens if your circuit has state 011*) **[1 + 3 + 1].**