Digital Circuits and Systems

Mid Semester Exam

Date: 3rd Sep. 2013   Time: 55 Minutes   Max Marks. 30
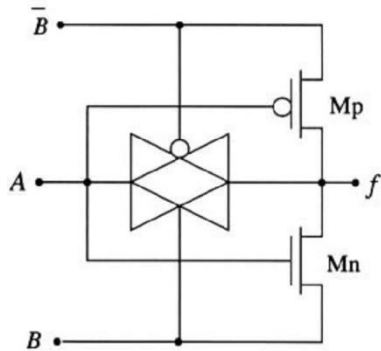
Notes: All questions are compulsory.
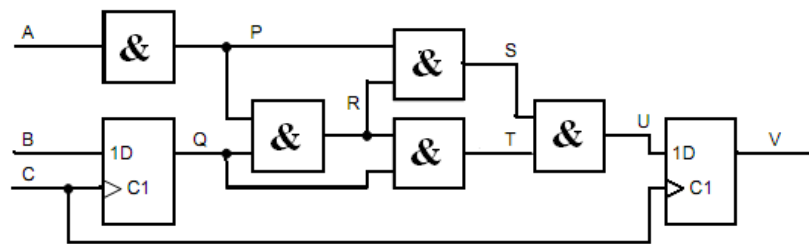Marks of each question are mention against it.
Assumptions made should be written clearly.

1: Analyze the circuit given in figure 1 and express the value of **f** in OAI form.   **[5]**

Figure 1   **Figure 2**

2: Implement the function $Z = F (A, B, C) = \sum m (1, 3, 6)$ using only one PFET and multiple NFETs.   **[5]**

3: Describe a 2x2 bits multiplier, that is, each operand represents an integer in the range 0 to 3. Give the following descriptions.
        High level using arithmetic expressions.
        Table of arithmetic functions
        A table representation of switching functions, with inputs and outputs in a binary code.   **[5]**

4: Consider the following system description.
        Input: $x(t) \in \{0,1\}$
        Output: $z(t) \in \{0,1\}$
        Function: $z(t) = \begin{cases} 1 \ if \ x(t-2,t) = 101 \\ 0 : Otherwise \end{cases}$
If input sequence from t=0 to t=8 is 001010100 Then what is the output sequence.   **[5]**

5: In the circuit shown in figure 2, the propagation delay of the flip flops may vary between 4 and 7 ns while the propagation delay of the gates may vary between 2 and 6 ns. Calculate the minimum and the maximum propagation delays between C and U. Hence calculate the maximum frequency of the clock, C.   **[5]**

6:

   (A) If a system has inputs from decimal numbers 5 to 20, how many minimum binary bits are required to describe the system in binary?   **[2]**
   (B) A combinational system has as input a 3 digit decimal number and as output the 9's complement of the system. Give a high level description of the system.   **[3]**