0.1 ECE 124 - Example Questions

1. Perform substraction on the given unsigned binary numbers using the 2’s complement
   (a) 10011-10001 (b) 100010-100011 (c) 1001-101000 (d) 110000-10101

2. Simplify the following equations by the boolean algebra rules and/or De Morgan’s theorem if any necessary, and draw the simplified logic circuit
   (a) \( X = (B + D)(A + C) + ABD \)  (b) \( Y = AB + BC + ABC \)  (c) \( X = (AB) + C + BC \)
   (d) \( Z = AB + (\bar{A} + C) \)

3. Obtain the truth table of the following functions, and express each function in sum of minterms and product of maxterms form
   (a) \((xy + z)(y + xz)\)  (b) \((x + y')(y' + z)\)

4. Implement the boolean function \( F = xy + x'y' + y'z \) with NAND and inverter gates and then with NOR and inverter gates

5. Using the K-map, reduce the following equations to a minimum form
   (a) \( X = AB\bar{C} + \bar{A}B + \bar{A}\bar{B} \)  (b) \( W = \bar{B}(C\bar{D} + \bar{A}D) + \bar{B}\bar{C}(A + \bar{A}D) \)

6. Use a multiplexer to implement the function
   \( X = (B + D)(A + C) + ABD \)

7. Sketch the output waveform at Q for the following a NAND gate SR latch and a D-flip flop.

\[ \text{Diagram of D-flip flop and SR latch} \]

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