IS 151 TEST 1 (Jan 2016)

1. Mention three equivalent ways of representing a Boolean function/expression **(3 Marks)**

2. What are 3 common useful functions that can be performed by digital logic circuits? **(3 marks)**

3. Simplify the following Boolean expressions using Karnaugh maps
    (a) A'B'C'D' + A'B'CD' + AB'C'D' + AB'CD'   **(1 mark)**
    (b) ABC + BCD' + A'BC   **(1 mark)**

4. Using Boolean algebra rules simplify the following expressions:
    (a) (A'BC')' + (AB'C)'   (b) C(B + C)(A + B + C)   (c) A'B + AB' + AB   (d) A'BC + AB'C + ABC' +
        ABC **(4 Marks)**

5. Convert the following binary numbers to decimal:
    (a) 110101   (b) 1110101   **(2 Marks)**

6. Convert the following decimal numbers to binary:
    (a) 368   (b) 125   **(2 Marks)**

7. Convert the following hexadecimal numbers to binary
    (a) 3AF   (b) 12C9   **(2 Marks)**

8. Construct a truth table for each of the following Boolean expressions:
    (a) ABC' + A'B'C' + A'BC' + AB'C **(1 Mark)**   (b) AB + AC + BC **(1 Mark)**

9. A combinational circuit has 3 inputs A, B, C and output F. F is true for the following input
    combinations:
            A is False, B is True
            A is False, C is True
            A, B, C are False
            A, B, C are True
    (a) Write the Truth table for F. Use the convention True=1 and False=0 **(1 Mark)**
    (b) Write the simplified expression for F in SOP form   **(1 Mark)**
    (c) Write the simplified expression for F in POS form   **(1 Mark)**
    (d) Draw the logic circuit diagram of F   **(1 Mark)**

10. Construct the truth table and draw the logic circuit diagram of a Half Adder (HA) **(6 Marks)**