BRAC UNIVERSITY
CSE460
VLSI DESIGN
Assignment - 1

Name: ***ID:*** ***Section:***

Question 1:[10 Marks]

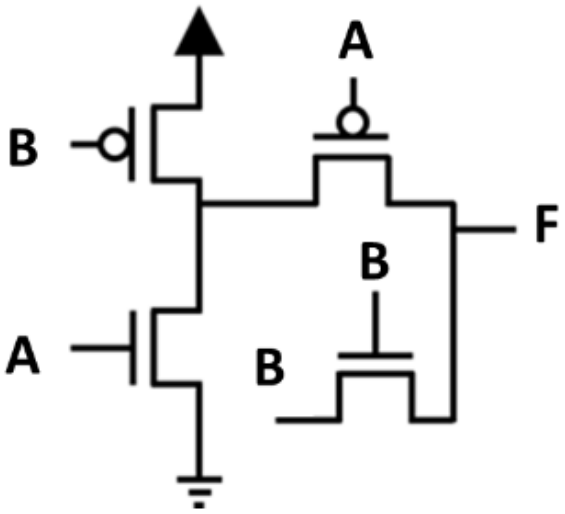
Design a CMOS implementation of the following functions:

(a) Y = ((A . B . C) + D) . E

(b) Y = (A + (B . C)) . (D + E)

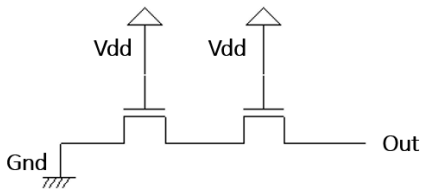
Question 2:[10 Marks]

Complete the truth table from the given circuit. Floating state or Z is also a possible answer.

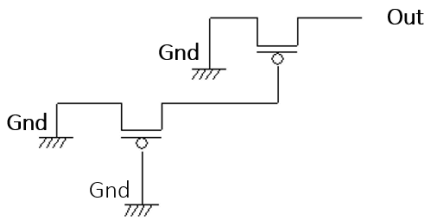


A	B	F
0	0	
0	1	
1	0	
1	1	

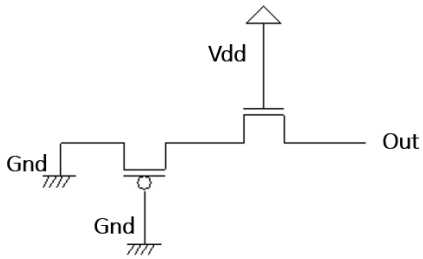
Question 3:[10 Marks]



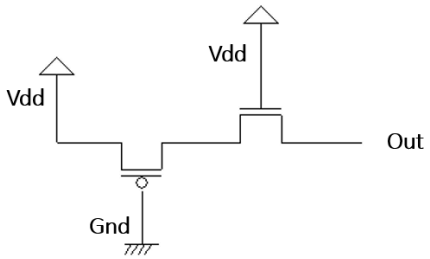
(a)



(b)



(c)



(d)

Find the value of Out for each of the above pass transistor circuits.

Question 4:[20 Marks]

Consider you need to design a temperature control system for your classroom at BRAC University. Your system has 1 Output **D**, and 3 inputs **A**, **B,** and **C** that come directly from three different sensors installed in the room. When a certain threshold of the temperature is crossed, each sensor gives a logical **HIGH** output. Your logic circuit should turn on the AC (**D = 1**) when the **majority** of inputs are **HIGH**.

(a) Convert the problem statement into a Truth Table and write the simplified Boolean expression.
(b) Implement the logic with a CMOS implementation.
(c) How many transistors are required in the CMOS implementation?
(d) Can you implement the logic with only NAND gates? If so, show the implementation.

Question 5:[10 Marks]

Imagine a logic circuit with 1 output **f**, and 4 input lines ***d3, d2, d1, and d0***.

- Let's define a 2-bit selector input **S = *s1 s0***
- The output **f** is determined as follows:

S	**f**
00	*d3*
01	*d2*
10	*d1*
11	*d0*

(a) Write the Boolean expression for this logic and implement the circuit using basic gates.
(b) Implement this logic using a 2-to-1 multiplexer.