

## “VLSI Layout Design” Program

# Entrance Exam (example)

### Exam Structure:

Open and “American style” questions

### Instructions:

- ✓ Exam duration: 45 min
- ✓ Questions number: 20
- ✓ Mark the correct answer on the question’s page.
- ✓ Only one answer is correct or several if it defined in the question.
- ✓ Answer all questions
- ✓ Auxiliary material:
  - Closed

### Grade policy:

Value of each question is defined in the task definition.

## Good Luck

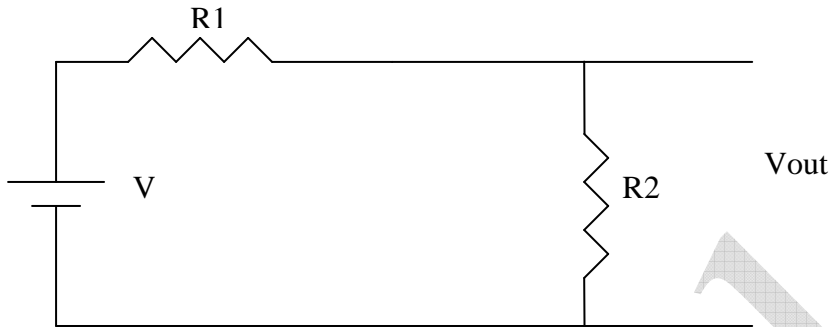
*Student Name:* \_\_\_\_\_

*ID Number:* \_\_\_\_\_

*Date of exam:* \_\_\_\_\_

**Question 1**

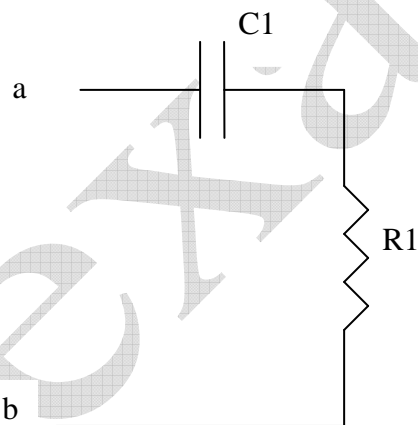
Please select the proper equation for the output (Vout):



- a.  $V_{out} = V \times (R2 \times R1) / (R1+R1)$
- b.  $V_{out} = V \times R2 / (R1+R1)$
- c.  $V_{out} = V \times R2 / (R1+R1)$
- d.  $V_{out} = V \times R2$

**Question 2**

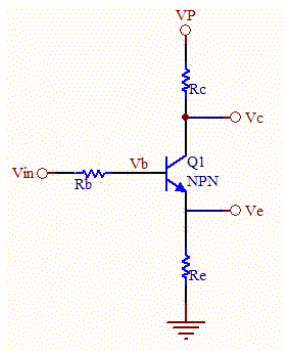
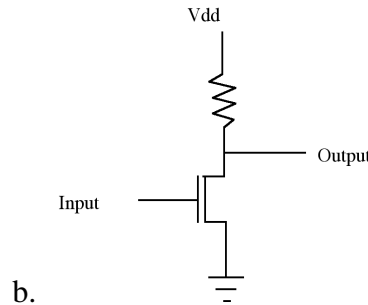
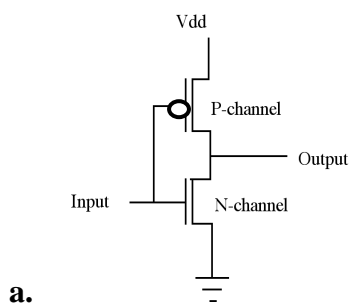
What is the impedance of the circuit between a & b ?



- a.  $Z_{total} = R1 + C1$
- b.  $Z_{total} = R1 + 2\pi fc$
- c.  $Z_{total} = R1 + j2\pi fc$
- d.  $Z_{total} = R1 - j/(2\pi fc)$

**Question 3**

Please select the circuit which describes a CMOS inverter:




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**Question 4**

How many transistors are required in CMOS to implement a NAND gate?

- a. 2
- b. 4
- c. 8
- d. NAND gate can not be implemented in CMOS, but only in NMOS

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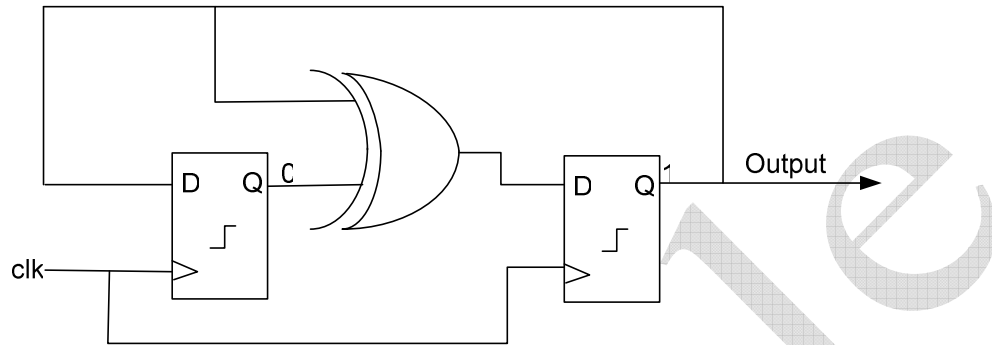
**Question 5**

Which of the following represents XOR?

- a.  $Z = (X \text{ and not } Y) \text{ or } (\text{not } X \text{ and } Y)$
- b.  $Z = (X \text{ and } Y) \text{ or } (\text{not } X \text{ and not } Y)$
- c.  $Z = \text{not } (\text{not } X \text{ and not } Y)$
- d.  $Z = (X \text{ and not } Y) \text{ and } (\text{not } X \text{ and } Y)$

**Question 6**

What does the following circuit do?



- a. Recognizes a change in the input
  - b. Generates an inverted clock at the output
  - c. Divides the clock by 2
  - d. Generates a fixed pattern of “110”
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**Question 7**

In a shift register of 8 bits:  $V[7:0]$ , a shift right is performed. The LSB bit:

- a. Gets pushed out and disappears
  - b. Is pushed to the MSB
  - c. Is moved to bit  $V[7]$
  - d. All answers are possibly correct
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**Question 8**

What is a tri-state bus and what is it used for?

- a. A tri-state bus has 3 possible states: 0,1,Z and is used for bi-directional bus
  - b. A tri-state bus has 3 signals only and is used for write control
  - c. A tri-state bus has 3 possible states: 0,1,X and can indicate when the bus is in unknown state
  - d. None of the answers is true
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