

Test 1 practice paper B (theory)

This assessment contains questions that allow partial credit.

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12 OF 12 QUESTIONS REMAINING

Test Content

Question 1

5 Points

Without any further simplification, which of the following expressions are in disjunctive normal form (DNF), conjunctive normal form (CNF) or neither?

a) $(A \wedge B) \vee C$

b) $(A \vee \neg B) \wedge (C \vee A)$

c) $\neg(A \wedge B) \wedge (\neg B \vee C)$

d) $(\neg B \wedge \neg C) \vee \neg(B \wedge A)$

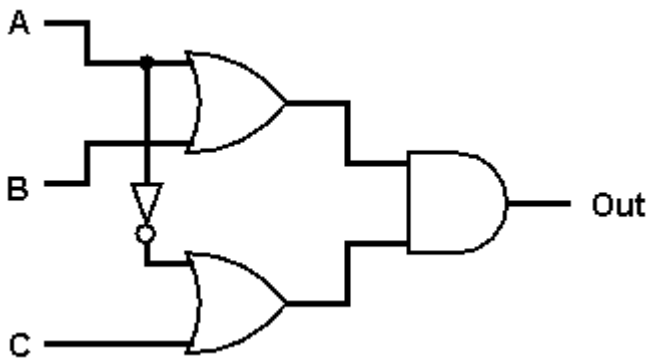
e) $(C \wedge \neg A) \vee (B \wedge \neg C)$

Question 2

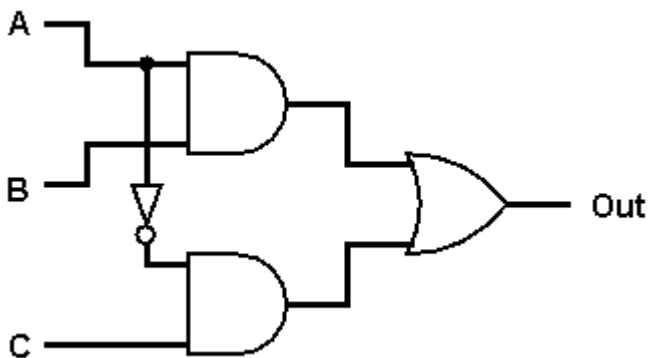
3 Points

For the logical equation $Out = (A \vee B) \wedge (\neg A \vee C)$, which of the following circuit diagrams is a direct implementation that includes no simplifications or algebraic manipulations?

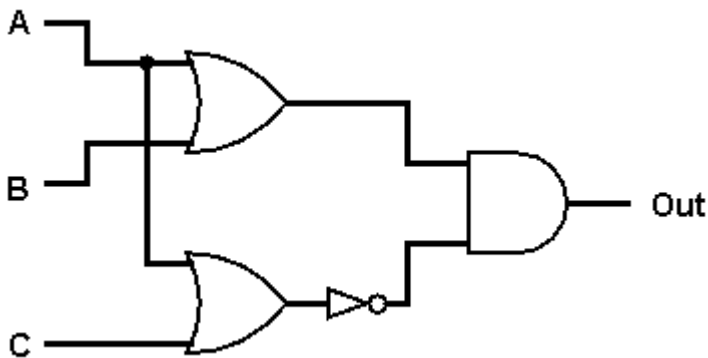
☐ A.



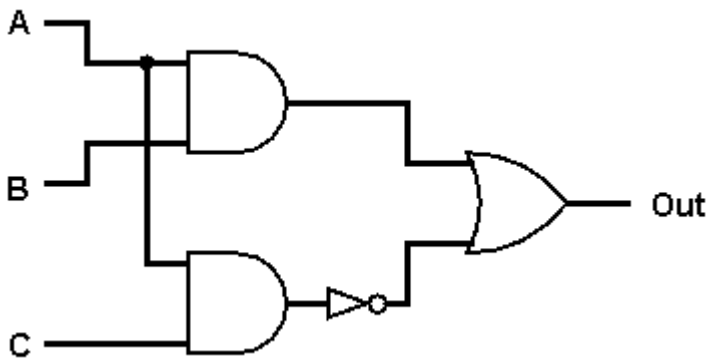
☐ B.



☐ C.



☐ D.



☐ E. None of the other options.

Question 3

4 Points

Which of the following expressions are logically equivalent?

a) $A \wedge (B \vee C)$ $(A \wedge B) \vee (A \wedge C)$

b) $(A \wedge B) \vee C$ $(A \wedge C) \vee (B \wedge C)$

c) $A \wedge (B \wedge C)$ $(A \wedge C) \wedge (B \wedge C)$

d) $(A \vee B) \vee C$ $A \vee (B \vee C)$

Question 4

4 Points

Complete the following truth table for an **active-high** R-S latch, where Q_{prev} is the previous value of Q and Q'_{prev} is the previous value of Q' :

R	S	Q	Q'
0	0		
0	1		
1	0		
1	1		

Question 5

5 Points

Which of the following statements are **true**?

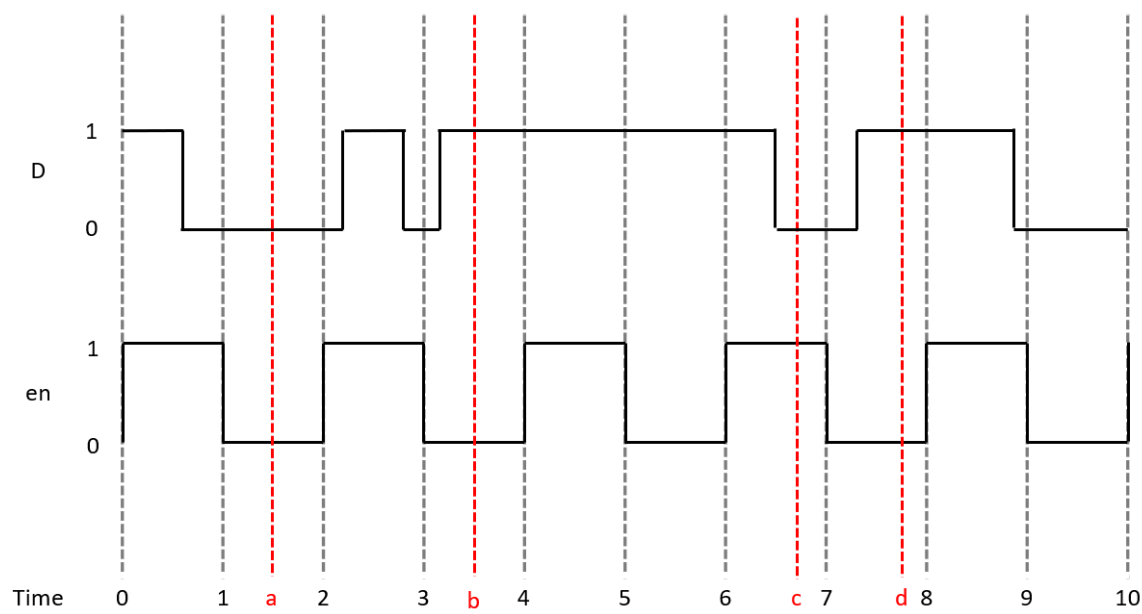
a) A latch is level-triggered.

b) It is faster to access data stored in RAM than in ROM.

- c) A Mealy machine will require more states than the equivalent Moore machine.
- d) A demultiplexer with 2 select bits will have 4 inputs.
- e) Given a low input, a one-shot outputs a high signal for exactly one clock cycle.

Question 6

4 Points



For the above **falling-edge** D flip-flop waveform, complete the following table for its output Q at the highlighted points in time:

Time	a	b	c	d
Q				

Question 7

3 Points

What is the value of the 8-bit binary number 0b10110010 using the following representations? Your answers should be decimal numbers **using digits and a negative sign, if necessary, only**.

a) Unsigned representation:

b) Signed-magnitude representation:

c) 2's complement representation:

Question 8

4 Points

cd \ ab	00	01	11	10
00	0	0	0	0
01	0	0	1	1
11	1	0	w	x
10	1	0	y	z

If the above Karnaugh map generates the formula $(b \wedge c) \vee (a \wedge \neg d)$, what must the values of w, x, y and z be?

- a) w =
- b) x =
- c) y =
- d) z =

Question 9

6 Points

Complete the following sentence by selecting the correct options from each drop-down list:

For a RAM circuit with 8 bytes of memory split into , a demultiplexer with a 4-bit select input is required to number.

Question 10

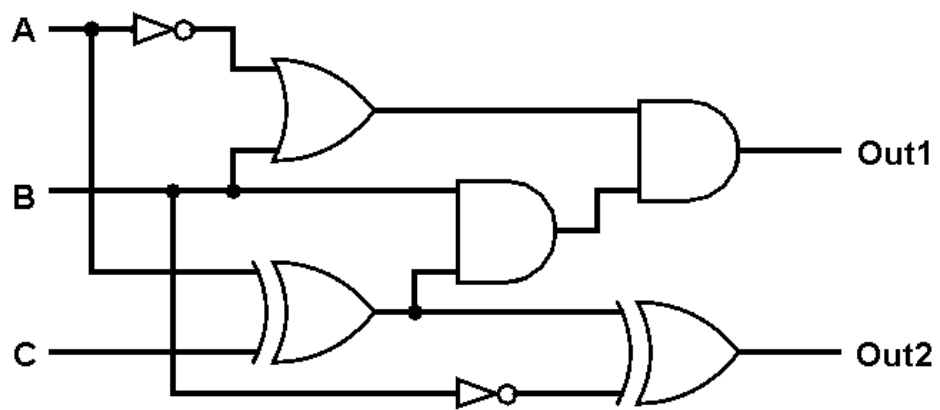
6 Points

What are the values of the following 8-bit 2's complement hexadecimal numbers? Your answers should be decimal numbers **using digits and a decimal point, if necessary, only**.

- a) 0xA1 =
- b) 0x2F =
- c) 0xD6 =

Question 11

6 Points



The circuit diagram above calculates two outputs *Out1* and *Out2*, given three inputs *A*, *B*, and *C*. The following component propagation delays can be assumed:

Component	NOT	AND	OR	XOR	Wires
Propagation delay	5 ps	10 ps	15 ps	20 ps	Negligible

What is the highest clock frequency possible such that if inputs *A*, *B* and *C* change on the rising edge of a clock cycle, then *Out1* and *Out2* will always be correct by the rising edge of the next clock cycle? Your answer should be a decimal value, given in MHz.

Add your answer

Integer, decimal or E notation allowed

Question 12

0 Points

Are there any questions in the test (in either the theory or practical component) where you weren't sure what the question meant, or where you think there might be a mistake in the question? If so, please give details and explain how you interpreted the question.

This question has no marks associated with it, and you should just leave it blank if the answer is "no".

Use the editor to format your answer

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