

Quiz - Lecture 22

Due 16 Oct at 23:59 **Points** 5 **Questions** 5 **Available** 15 Oct at 9:10 - 16 Oct at 23:59 1 day
Time limit None **Allowed attempts** Unlimited

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Attempt history

	Attempt	Time	Score
KEPT	Attempt 2	2 minutes	5 out of 5
LATEST	Attempt 2	2 minutes	5 out of 5
	Attempt 1	less than 1 minute	1.5 out of 5

Score for this attempt: **5** out of 5

Submitted 16 Oct at 13:32

This attempt took 2 minutes.

Question 1

1 / 1 pts

Consider the grammar rule for an if:

ifStatement ::= 'if' '(' expression ')' '{' statements '}' ('else' '{' statements '}')?

Which, if any, of the following code generation rules are correct?

expression

not

if-goto IF_TRUEEn

goto IF_FALSEEn

label IF_TRUEEn

statements

goto IF_ENDn

label IF_FALSEEn

statements?☐

label IF_ENDn

Correct!**expression**

not

if-goto IF_FALSEEn

statements

goto IF_ENDn

label IF_FALSEEn

statements?☒

label IF_ENDn

Correct!**expression**

not

if-goto IF_TRUEEn

statements

goto IF_ENDn

label IF_TRUEEn

statements?☒

label IF_ENDn

Correct!**expression**

```
if-goto IF_TRUEn  
goto IF_FALSEn  
label IF_TRUEn
```

statements

```
goto IF_ENDn  
label IF_FALSEn
```

statements?

```
label IF_ENDn
```

expression

```
if-goto IF_FALSEn
```

statements

```
goto IF_ENDn  
label IF_FALSEn
```

statements?

```
label IF_ENDn
```

Question 2

1 / 1 pts

You want to add a 16-bit multiply operation to your Hack processor because you think that programs that need to multiply two numbers together will run much faster.

If the longest path in your processor includes a 16-bit add operation that must be used to implement the 16-bit multiplier and it is not possible to shorten the longest path, which of the following statements will be true if you implement the 16-bit multiplier? Select all statements that will be true.

Correct!

- ☒ Programs that multiply numbers together may be slower.
- ☐ No programs will run faster.
- ☐ All programs will run faster.
- ☐ Programs that do not multiply numbers together will not be affected.
- ☐ No programs will run slower.

Correct!

- ☒ Programs that multiply numbers together may be faster.

Correct!

- ☒ Programs that do not multiply numbers together will be slower.

All multiplies will now be one instruction instead of all the instructions required to implement a multiply function which will be very much faster. However, the clock cycle must now be a lot longer so every instruction will now take longer to execute. Programs that do not multiply numbers together will be slower. If a program does multiply numbers together it will only be faster if it executes sufficient multiplies that the speed up is greater than the overall slow down.

Question 3**1 / 1 pts**

In the absence of any other changes, increasing which of the following aspects of a processor could decrease the power consumption? Select all answers that are correct.

☐ The number of gates in the processor.

☐ The capacitive load of the processor.

Correct!

☒ The length of the clock cycle.

☐ The voltage of the power supplied to the processor.

☐ The clock frequency.

Correct!

☒ The longest path through the processor.

Power consumption is proportional to Capacitive Load x Voltage x Voltage x Clock Frequency. A longer clock cycle, which is dependent on the longest path, could require a slower clock frequency and therefore lower power consumption. Adding more gates would increase the capacitive load.

Question 4

1 / 1 pts

At the start of a new clock cycle the RAM transmits the contents of memory location 512 to the CPU. Which of the following would always cause this to happen? Select all that are true.

☐ The A register contains 512.

Correct!

☒ The previous instruction read a value from RAM address 512.

Correct!

☒ The previous instruction was a jump to ROM location 512.

☐ The D register contains 512.

☐ The previous instruction was @512.

Correct!

☒ The previous instruction wrote a value to RAM address 512.

At the start of a clock cycle the RAM will always output the data from the location identified by the A register's previous value until the current value has had time to propagate through the RAM's multiplexors. So in this case the previous instruction must have started with the value 512 in the A register even if it was not accessing RAM.

Question 5

1 / 1 pts

If the load signals to the A, D and PC registers and the RAM in the Hack machine were set to 0, so that their contents cannot be changed, what would happen to the currently executing program?

☐ It would behave unpredictably because the registers would not change as expected.

Correct!

☒ The power consumption might drop dramatically.

Correct!

☒ It stops.

☐ It would keep executing the current instruction over and over again.

☐ The power consumption might dramatically increase.

If the A, D and PC registers and RAM cannot change the execution of the current instruction never completes. In effect the executing program is stalled. Since there are no new signals to be propagated during each clock cycle the transistors do not need to change state which could significantly reduce power consumption.

Quiz score: **5** out of 5