Quiz 2

Question 1

Given the X86-64 assembly instructions below, suppose variable "a" and "b" are long int data variables, "a" is in register %rax, and "b" is in register %rbx.

Please translate the assembly instructions into C statements and fill in the blank with a decimal number: "a = (____) *b;"

Assume no overflow occurs in the program.

```
movq $2, %rdx
salq %rdx, %rbx
movq %rbx, %rdi
imulq %rdx, %rbx
addq  %rbx, %rdi
movq %rdx, %rax
```

Selected Answer: 4

Correct Answer:

Evaluation Method	Correct Answer
Exact Match	12

Question 2

For the following X86-64 assembly instructions, which of them is/are incorrect?

Selected Answers: C. movl %esi, (%rax)
D. setge %ecx

Answers:
A. movw (%rsp, %rcx, 4), %dl
B. movb $71, %al
C. movl %esi, (%rax)
D. setge %ecx
E. cmpl %bl, %di
F. sarw $6, %cx

Question 3

Given the following Y86-64 instructions, suppose the starting address of the first instruction will be 0x200.

So the target address for the first jump instruction "jge" is (_____).

To correctly write the address, please use the format like 0x200, the address is started with "0x" followed by 3 hex-decimal digits.

```
   rrmovq %rbx, %rax
   irmovq $35, %rdx
   jge L2
L1
   rmmovq %rdx, 20(%rax)
L2
   xorq %rax, %rcx
   jl L1
```

Selected Answer: 0x20E

Correct Answer:

Evaluation Method	Correct Answer
Exact Match	0x21F

Question 4

The given C code is compiled into the given X86-64 assembly instructions.

Suppose "a", "b", "c" are all long int variables, "a" is in register %rax, "b" is in register "%rbx", "c" is in register %rcx.

Assume no overflow occurs in the program.

Which one is the correct test condition that should be filled into the blank?

```
while (_____)
    a += 3;

loop_while:
   movq %rbx, %rdi
   addq %rcx, %rdi
   jmp TS
LB:
   addq $3, %rax
TS:
   cmpq %rdi, %rbx
   jle LB
   ret
```

Selected Answer: B. b >= c

Answers:
A. c >= 0
B. b >= c
C. b > a + c
D. a – c >= 0
E. None of the above answers is correct

Question 5

The C code "b = c;" is compiled into X86-64 assembly code "movl 0x20(%rcx), %eax".

Suppose that variables "b" and "c" have the same data type in C language, "b" is stored in some portion of register %rax, and "c" is stored in the main memory.

What is/are the possible data type(s) of variables "b" and "c"?

Selected Answers: B. unsigned short
C. short

Answers:
A. char
B. unsigned short
C. short
D. unsigned int
E. int
F. double

Question 6

The Y86-64 assembly instruction "mrmovq $23(%rbp), %rbx" will be translated into the machine code (_____) with the Y86-64 ISA.

Please write the machine code in hex-decimal form, which means each hex-decimal digit represents 4-bit binary digits, and two hex-decimal digits represents one byte. The machine has a little-endian byte ordering.

Notice: (1) please do NOT leave blanks between any two hex-decimal digits of the machine code; (2) please do NOT add 0x before the code.

Selected Answer: 5035170000000000000

Correct Answer:

Evaluation Method	Correct Answer
Exact Match	5035170000000000000

Question 7

To execute the Y86-64 instruction "jle 0x0120" on the CPU introduced in Lecture 6, there will be no operation(s) in which step(s)?

Selected Answers: C. Decode
E. Memory
F. Fetch

Answers:
A. PC update
B. Write back
C. Decode
D. Execute
E. Memory
F. Fetch

Quiz 2

Question 8 0 out of 1 points

The execution of each instruction on a CPU is composed of 6 sequential steps (A – F).

Please partition the 6 sequential steps into 2 stages and insert a register after each stage.

The time delay spent on each operation is given in the figure, and the time delay spent on each inserted register level will be 10ns. (1ns = 10^{-9} second).

A	B	C	D	E	F
50ns	40ns	10ns	20ns	30ns	25ns

To achieve the maximal throughput, the 6 sequential steps should be partitioned between **[A]** and **[B]**, and the maximal throughput of this pipeline is **[C]** instructions per second.

For example, if you think A is in the first stage, and B, C, D, E, F are in the second stage, please input A in the first blank, and input B in the second blank.

Specified Answer for: A B

Specified Answer for: B C

Specified Answer for: C 9.090909091

Correct Answers for: A

Evaluation Method	Correct Answer	Case Sensitivity
Exact Match	B	

Correct Answers for: B

Evaluation Method	Correct Answer	Case Sensitivity
Exact Match	C	

Correct Answers for: C

Evaluation Method	Correct Answer	Case Sensitivity
Exact Match	10	

Question 9 0 out of 1.5 points

The given C code is compiled into the given X86-64 assembly instructions.

Suppose "a" and "b" are all long int, "a" is stored in register %rax, "b" is stored in register %rbx. Assume no overflow occurs in the program.

The number in the first blank is **[A]**, and the number in the second blank is **[B]**.

Notice: please input your answers by writing numbers in 10-base decimal form.

```
a := 34 * b;
return a;

Assembly code:
movq %rbx, %rcx
salq $____, %rbx
addq %rbx, %rcx
movq %rcx, %rax
salq $____, %rax
ret
```

Specified Answer for: A 5

Specified Answer for: B 5

Correct Answers for: A

Evaluation Method	Correct Answer	Case Sensitivity
Exact Match	4	

Correct Answers for: B

Evaluation Method	Correct Answer	Case Sensitivity
Exact Match	1	