

0917432 Computer Architecture and Organization 2 (Fall 2023)

Quiz 1

القاعة:

رقم التسجيل:

الاسم:

**Instructions:** Time **15** minutes. Open book and notes exam. No electronics. Please answer all problems in the space provided and limit your answer to the space provided. No questions are allowed.

**P1.** Complete the following table based on your understanding of Moore's Law.

Year	Transistors/chip
$x$	15 billion
$x + 2$	30 billion
$x + 6$	<b>120 billion</b>

**From  $x$  to  $x + 2$ , there is doubling in two years.**

**From  $x + 2$  to  $x + 6$ , there are two doubling intervals.**

**Therefore,**

$$\text{Transistors/chip} = 30 \times 2^2 = 120 \text{ billion}$$

**P2.** Assume that the following RISC-V instruction sequence is executed on a dual-issue superscalar processor that features dynamic scheduling and speculation using reservation stations and reorder buffer like what you have learned in the class. Assume that this processor has two integer execution units, one address calculation unit, one memory port, and many reservation stations and reorder buffer entries. Use the pipeline diagram below to show how this processor executes the instruction sequence shown.

Instruction	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
add x1, x2, x3	<b>F</b>	<b>I</b>	<b>E</b>	<b>W</b>	<b>C</b>										
sub x4, x1, x5	<b>F</b>	<b>I</b>			<b>E</b>	<b>W</b>	<b>C</b>								
ld x1, 0(x4)		<b>F</b>	<b>I</b>				<b>A</b>	<b>M</b>	<b>W</b>	<b>C</b>					
add x5, x4, x7		<b>F</b>	<b>I</b>				<b>E</b>	<b>W</b>		<b>C</b>					

*<Good Luck>*