

BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Quiz - 2
 Duration: 25 minutes

Semester: Fall 2024
 Full Marks: 15

CSE 340: Computer Architecture

Name: <u>Solution</u>	ID:	Section:
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1. Write RISC-V assembly code that checks if the number stored in register X25 is divisible by 2 or not. If divisible then store 1 in register X26 otherwise store 0. [4]

Answer:

<pre> ADDI X21, X0, 1 AND X26, X25, X21 BEQ X26, X0, If ADDI X26, X0, 0 BEQ X0, X0, Exit </pre>	<pre> If: ADDI X26, X0, 1 Exit: </pre>
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2. In the RISC-V architecture, each instruction is encoded as a 32-bit binary sequence. In this standard format, the rs (source register) and rd (destination register) fields are typically 5 bits in size.

Suppose we are working with a prototype version of RISC-V that includes 56 registers. For this prototype version, what would be the required size of the rs or rd field? [3]

Answer: 56 registers = 0 - 55 $\Rightarrow 55 = \underbrace{110111}_{6 \text{ bits}}$
 required size = 6 bits

3. Find the RISC-V code of the following machine Codes.

i. 0x00AA9B93

[3]

Answer:

$\underbrace{0000\ 0000\ 1010\ 1010\ 1001}_{\text{imm}} \quad \underbrace{1011\ 1001\ 0011}_{\text{opcode} \rightarrow \text{I type}}$
 (Labels: f0, rs1, f3, rd)

Slli X23, X21, 10

ii. 0x08C2BAB3

[3]

Answer:

$\underbrace{0000\ 1000\ 1100}_{\text{funct7}} \quad \underbrace{0010\ 1011}_{\text{rs1}} \quad \underbrace{1010\ 1011\ 0011}_{\text{opcode} \rightarrow \text{R type}}$
 (Labels: rs2, f3, rd)

OR X21, X5, X12

4. What is the significance of the funct3 field in terms of LD instruction? [2]

Answer:

Machine understands the size of data transfer and the signedness of the transfer through funct3 field.

Format	Instruction	Opcode	Funct3	Funct7/Funct6
R	ADD	0110011	001	0000000
	SUB	0110011	110	0000001
	AND	0110011	010	0000001
	OR	0110011	011	0000100
	SLL	0110011	101	0000100
I	LD	0000011	000	N/A
	LW	0000011	010	N/A
	LH	0000011	011	N/A
	LB	0000011	001	N/A
	ADDI	0010011	000	N/A
	SLLI	0010011	001	000000
	SRLI	0010011	010	000000
	ORI	0010011	011	N/A
S	SD	0100011	000	N/A
	SW	0100011	001	N/A
	SH	0100011	010	N/A
	SB	0100011	011	N/A