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: Solution	ID:	Section:

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:

```
ADDi X21, X0, 1
AND  X26, X25, X21
BEQ  X26, X0, If
ADDi X26, X0, 0
BEQ  X0, X0, Exit
```

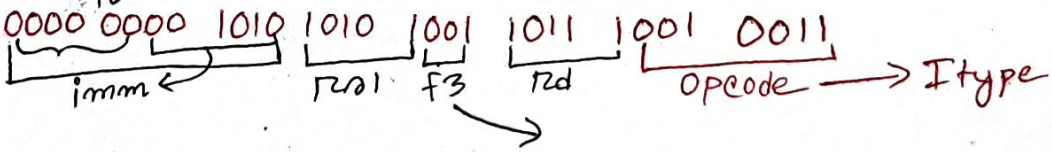
```
If:
ADDi X26, X0, 1
Exit:
```

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 60 registers. For this prototype version, what would be the required size of the rs or rd field? [3]
Answer: 60 registers = 0 - 61 ⇒ 61 = 111101 (6 bits.)

required size = 6 bits

3. Find the RISC-V code of the following machine Codes.
i. 0x**00AA9B93** [3]
Answer:

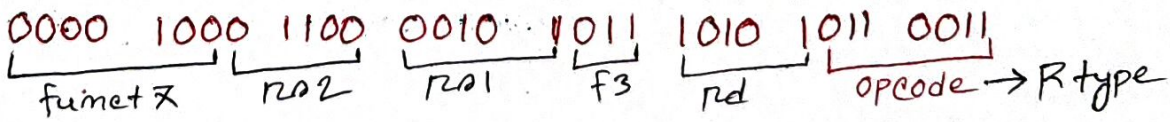
given number is a hex number



to find the instruction

SLLI X_{23}, X_{21}, 10

ii. 0x**08C2BAB3** [3]
Answer:



OR X_{21}, X_5, X_{12}

combination of funct3 + funct7 to find the instruction

4. Although SLLI is an I-type instruction, the immediate field is restricted to 6 bits. Explain the reason for this constraint? [2]

Answer: Register size = 64 bits. If we left/right shift a number by 64 bits, the value becomes 0. So, at max we can shift 63 times. [valid shifting]

111111 → 6 digits.

Hence, imm. field size is restricted to 6 bits.

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