

Computer Organization and Assembly Language (SE-204T)

Quiz# 1, Spring 2025

January 23, 2025

Name: _____

Roll Number: _____

Maximum Time Allowed: 15 minutes

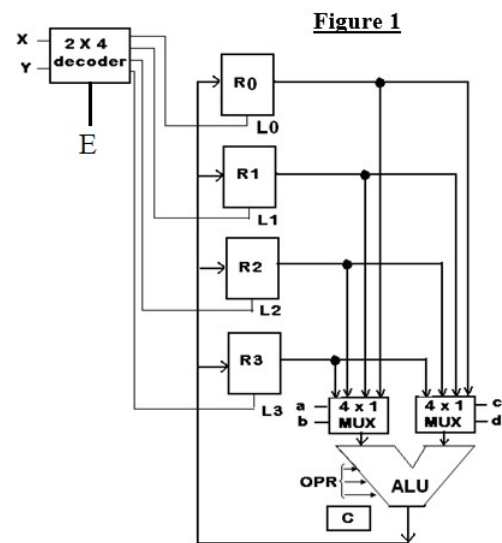
Maximum Marks: 10

1. Figure 1 below shows an ALU with four input registers R0, R1, R2 and R3 connected to the ALU through two multiplexers. All registers can be reset to zero by placing a 1 on the respective CLR input, but only registers R0 and R1 can be incremented by placing 1 on their INC input (CLR and INC inputs are not shown in the diagram below). The select inputs a, b, c and d decides the source operands. L0, L1, L2 and L3 are the load inputs of the registers controlled by 2-bits X and Y which select the destination register. When E = 0, the decoder is disabled (and no register can latch data available on the input bus). The ALU operation table is given below in table 1.

OPR bits	Operation Performed	Carry Flag affected
000	NOP	No
001	Addition	Yes
010	AND	No
011	OR	No
100	Complement (left MUX input)	No
101	Transfer (from left MUX)	No
110	ROL (Rotate Left) with carry (left MUX)	Yes
111	ROR (Rotate Right) with carry (left MUX)	Yes

C is the carry flag.

Table 1: ALU Operation Table



The 16-bit control word in this system has the following format:

bit #	15-13	12	11	10	9	8	7	6	5	4	3	2	1	0
	OPR	a	b	c	d	x	y	C0	C1	C2	C3	I0	I1	E

C0, C1, C2 and C3 are used to clear the contents of R0, R1, R2 and R3 respectively, while I0 and I1 are used to increment the contents of the registers R0 and R1 respectively. E is to enable the decoder

Write the sequence of control words (in hexadecimal) to perform the following operations using this system:

$R1 \leftarrow R1 + 1$

$R3 \leftarrow R3 \text{ AND } R2$

$R2 \leftarrow R2 - 1$

Note that one register operation may need more that one control words.

Register Operation	Control Word in Binary	Control word (in Hex)

What will be the updated register values if initially R0=0, R1=4, R2=3, and R3=7?