King Saud University
College of Computer and Information Sciences
Department of Computer Science

CSC 220: Computer Organization

Tutorial 8: Register and RTL

Q1: Design 4-bits register that performs the following operations using necessary flip-flops and MUXs.

i. a shift left (LD=0) and memory functions (LD=1)
ii. parallel load (LD=0) and rotate right (LD=1)

Q2: MCQ (Choose the correct answer)

i. If a register containing data (11001100) is subjected to arithmetic shift left operation, then the content of the register after the operation
(A) (11001100) (B) (10011001) (C) (1101100) (D) (10011000)

ii. The content of a 4-bit register is initially 1101. The register is shifted 2 times to the right with the serial inputs 1 and 0 respectively. What is the content of the register after each shift?
(A) (1110), (0111) (B) (0001), (1000) (C)(1101), (1011) (D) (1001), (1001)

Q3. Suppose 8-bit registers **R1** = 1110 0111, R2 = 0000 0101, where 2's complement signed number system is used. What will be the content of R3 after the following micro-operations?

i. R3 ← R1 - R2
ii. R3 ← R1 ⊕ R2
iii. R3 ← sl R1

Q4. Consider the following **RTL program** with the initial values (2's complement representation) of 8-bit registers R1 = 0001 0111, R2 = 1110 0111, R3 = 0000 0000. Show the contents of the registers after execution of each micro-operation sequentially.

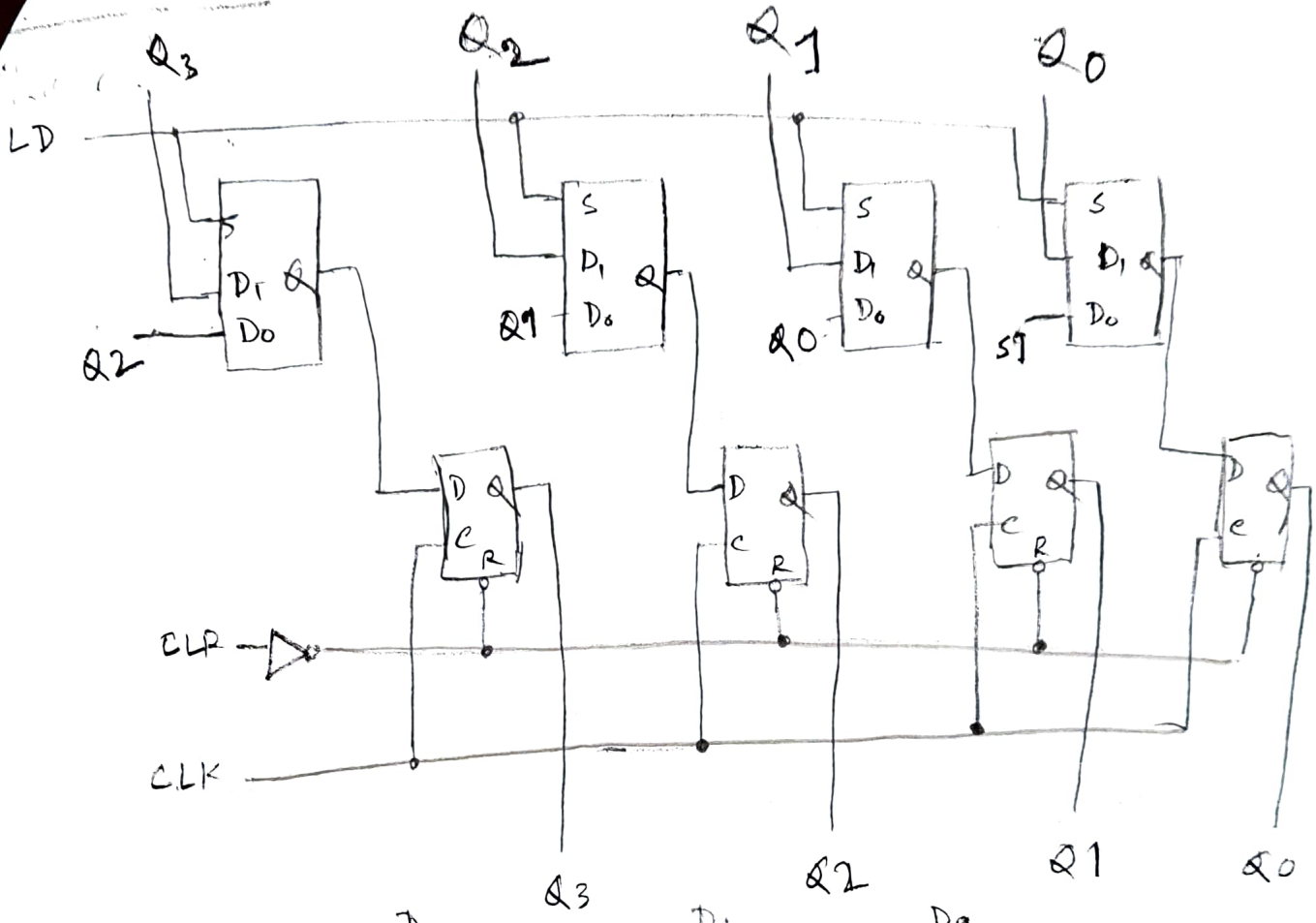
micro-operations	R1	R2	R3
R3 ← R1 + R2	0001 0111	1110 0111	1111 1110
R1 ← R2 + 1	1110 1000	1110 0111	1111 1110
R2 ← R1 ∧ R3	1110 1000	1110 1000	1111 1110

Q5. A digital computer has a common bus system for 8 registers of 16 bit each. The bus is constructed with multiplexers.

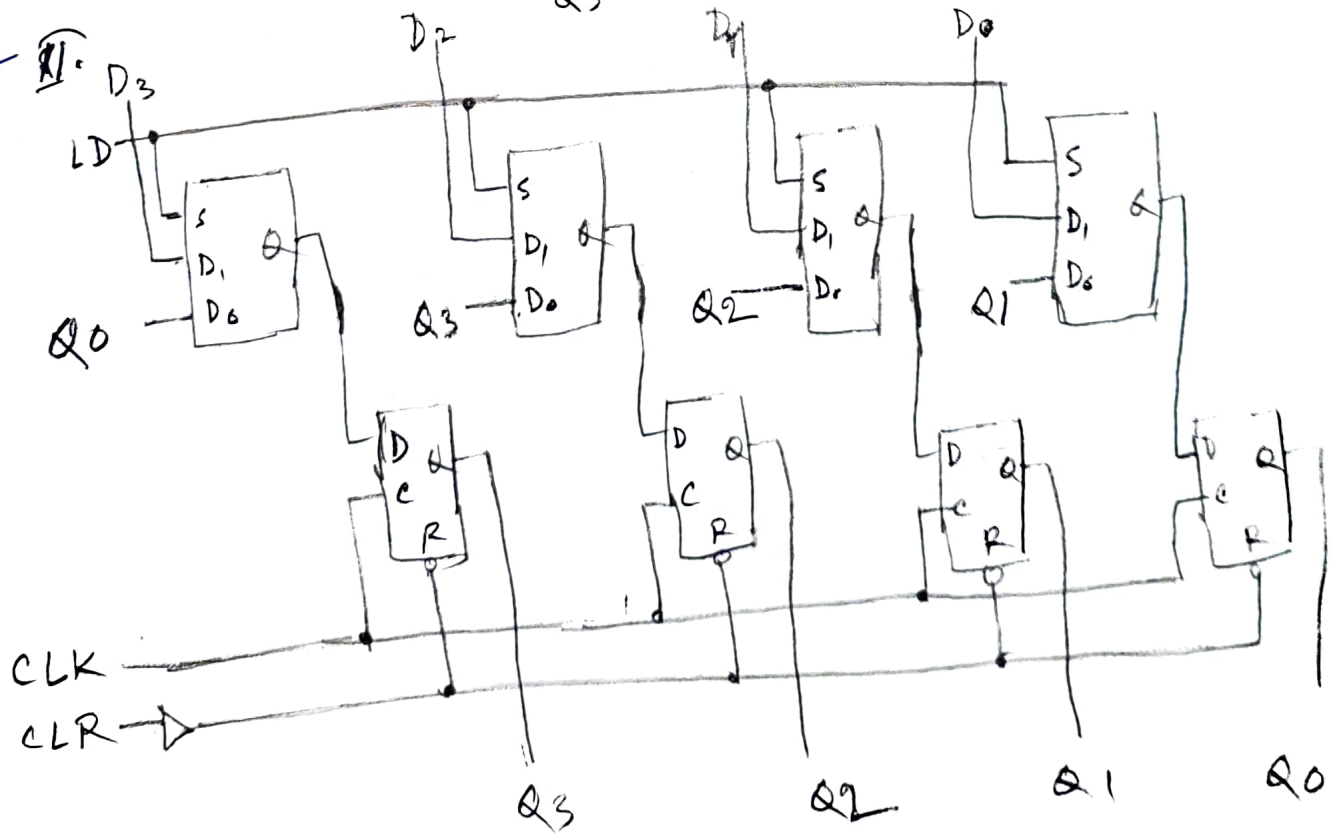
i. How many multiplexers are required?
ii. What is the size of a multiplexer?
iii. How many selection inputs are there is each multiplexer?

Tutorial 8

...tion 1.



(a) (b)



Solution 3 :

I. $-R2 = 11111011$

$R1 = 1110\ 0111$

$-R2 = 1111\ 1011$

$+$

$R3 = \overset{x}{1}\ 1110\ 0010$

II. $R1 = 1110\ 0111$

$R2 = 0000\ 0101$

$(+)$

$R3 = 11100010$

III. $R1 = 1110\ 0111$

$SLR1 = 1100\ 1110$

Solution 5.

I. 16

II. 8 to 1

III. 3