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 using necessary flip-flops and MUXs that performs the following operations:

i. 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 $\leftarrow$ R1 - R2
ii. R3 $\leftarrow$ R1 $\oplus$ R2
iii. R3 $\leftarrow$ sl R1

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

micro-operations	**R1**	**R2**	**R3**
R3 $\leftarrow$ R1 + R2			
R1 $\leftarrow$ R2 + 1			
R2 $\leftarrow$ R1 $\wedge$ R3			

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?

Home Works

Text book problems: 6-2 to 6-4, 6-17

Additional Problems

1. A digital computer has a common bus system for 16 registers of 8 bit each. The bus is constructed with multiplexers. What size of multiplexers is needed?

[A] 16 X1 [B] 4X1 [C] 2X1 [D] 8X1

2. A digital computer has a common bus system for 8 registers of 32 bit each. The bus is constructed with multiplexers. How many multiplexers are there in the bus?

[A] 16, [B] 8, [C] 4, [D] 32

3. What can be used to store one or more bits of data, which can accept and/or transfer information serially ?

[A] Parallel registers [B] Shift registers [C] Counters [D] None of these