


Student's Name:

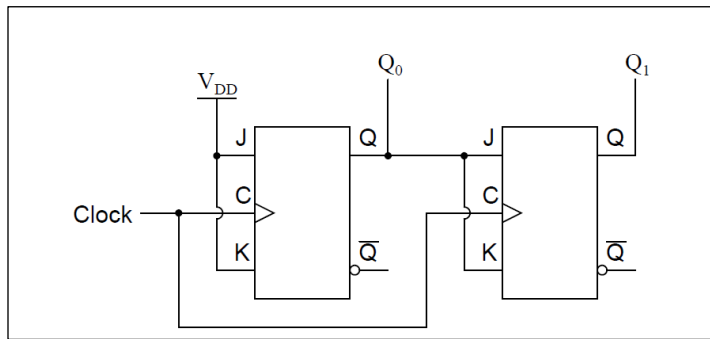
Student ID:

Section #:

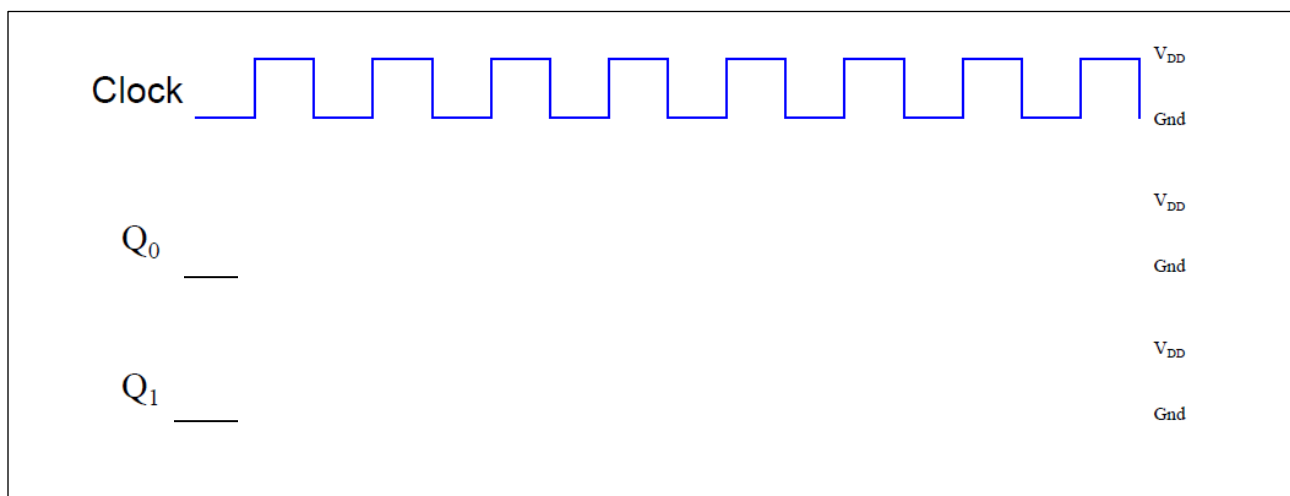
<b>King Saud University</b> <b>College of Computer and Information Sciences</b> <b>Computer Science Department</b>			 King Saud University College of Computer & Information Sciences Computer Science Department	
<b>Course Code</b>	CSC 220			
<b>Course Title</b>	Computer Organization			
<b>Semester</b>	S2 – 1440/1441 (Spring-20)			
<b>Exam</b>	Final			
<b>Date</b>	12/05/2020	<b>Duration</b>	<b>3 Hours</b>	
<b>Student's Name</b>				
<b>Student ID</b>				
<b>Section No.</b>				
<b>Course Learning Outcomes</b>		<b>Relevant question</b>	<b>Full mark</b>	<b>Student mark</b>
<b>Knowledge</b>	<b>CLO 1, 2, 3</b>	<b>1</b>	<b>4</b>	
<b>Knowledge</b>	<b>CLO 4, 5, 6, 7</b>	<b>2</b>	<b>4</b>	
<b>Cognitive Skills</b>	<b>CLO 2, 3, 5</b>	<b>3</b>	<b>3</b>	
<b>Cognitive Skills</b>	<b>CLO 4, 5</b>	<b>4</b>	<b>3</b>	
<b>Cognitive Skills</b>	<b>CLO 3, 5</b>	<b>5</b>	<b>3</b>	
<b>Cognitive Skills</b>	<b>CLO 3, 6, 7</b>	<b>6</b>	<b>3</b>	
<b>Instructions (read them carefully before solving questions):</b> <ol style="list-style-type: none"> <li>1. Write your Name, ID, and Section # on the top of each page.</li> <li>2. Solve all the questions and insert the solutions in the space provided..</li> <li>3. After writing/inserting all your solutions, <b>convert the paper into PDF, check your PDF file carefully, and submit it on LMS.</b></li> <li>4. <b>Plagiarism (copying others) is strictly prohibited.</b> All such solution will obtain a zero (0) score.</li> <li>5. Thirty (30) additional minute will be given to complete the submission process. All submission must be done within this time. <b>Any late submission will not be accepted.</b></li> </ol>				
<b>Feedback/Comments:</b>          				

## Question 1. (4 Marks)

Consider the following structure of a counter ( 2 bits)



1. Is it a ripple counter or synchronous counter?
  
2. Complete the timing diagram for the given circuit





### Question 3 (3 Marks)

1. Consider the 4 bits arithmetic unit based on 4-bits adder represented by figure 2.

Fill the following table

X3X2X1X0	Y3Y2Y1Y3	S2S1S0	G3G2G1G3	Cout
0111	0101	.....	G = X-Y	.....
0111	0101	001	.....	.....
0110	0001		0111	.....

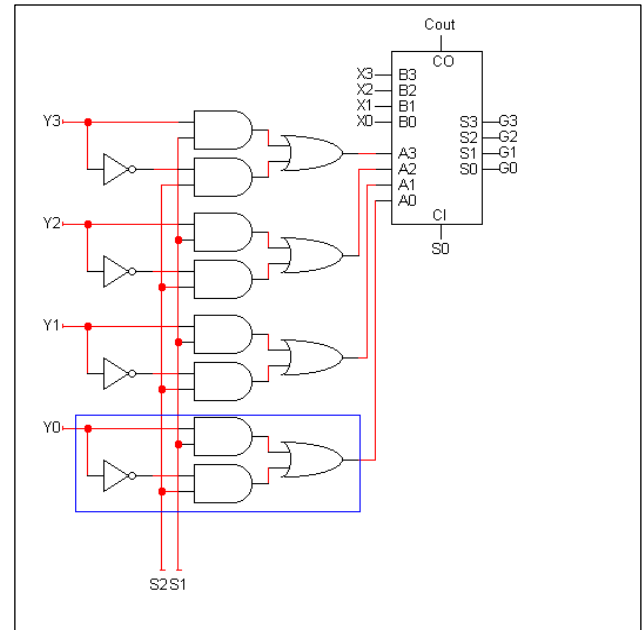


Figure 2.

2. We want to design a 4-bits logic unit ( figure 3) performing the following function table.

S1 S0	Output
00	$G_i = \overline{X_i} \overline{Y_i}$
01	$G_i = \overline{X_i} + Y_i$
10	$G_i = \overline{X_i} \oplus \overline{Y_i}$
11	$G_i = \overline{Y_i}$

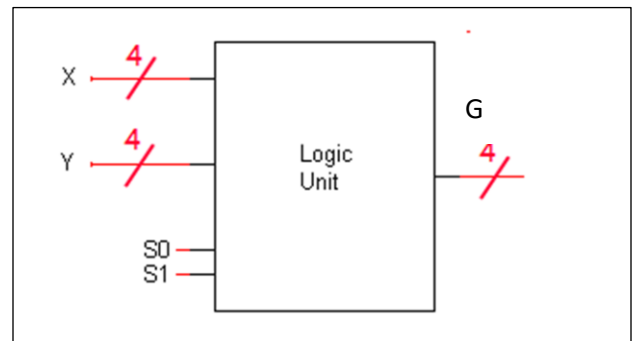


Figure 3.

Using gates and multiplexer 4/1, show how we can implement one output  $G_i$

**Question 4 (3 Marks)**

Consider the following micro-operations performed in the datapath represented by figure 4.

Determine the parameters of the control word associated with these micro-operations.

Micro-operations:

MO\_1:

$R2 \leftarrow R0 - R1$

MO\_2 :

$R3 \leftarrow M(R1)$

	MO_1	MO_2
D address (3 bits)		
A address (3 bits)		
B address (3 bits)		
MB select (1 bit)		
FS (4 bit)	XXXX	XXXX
MD select (1 bit)		
RW (1 bit)		
Register Write		
MW (1 bit)		
Memory Write		

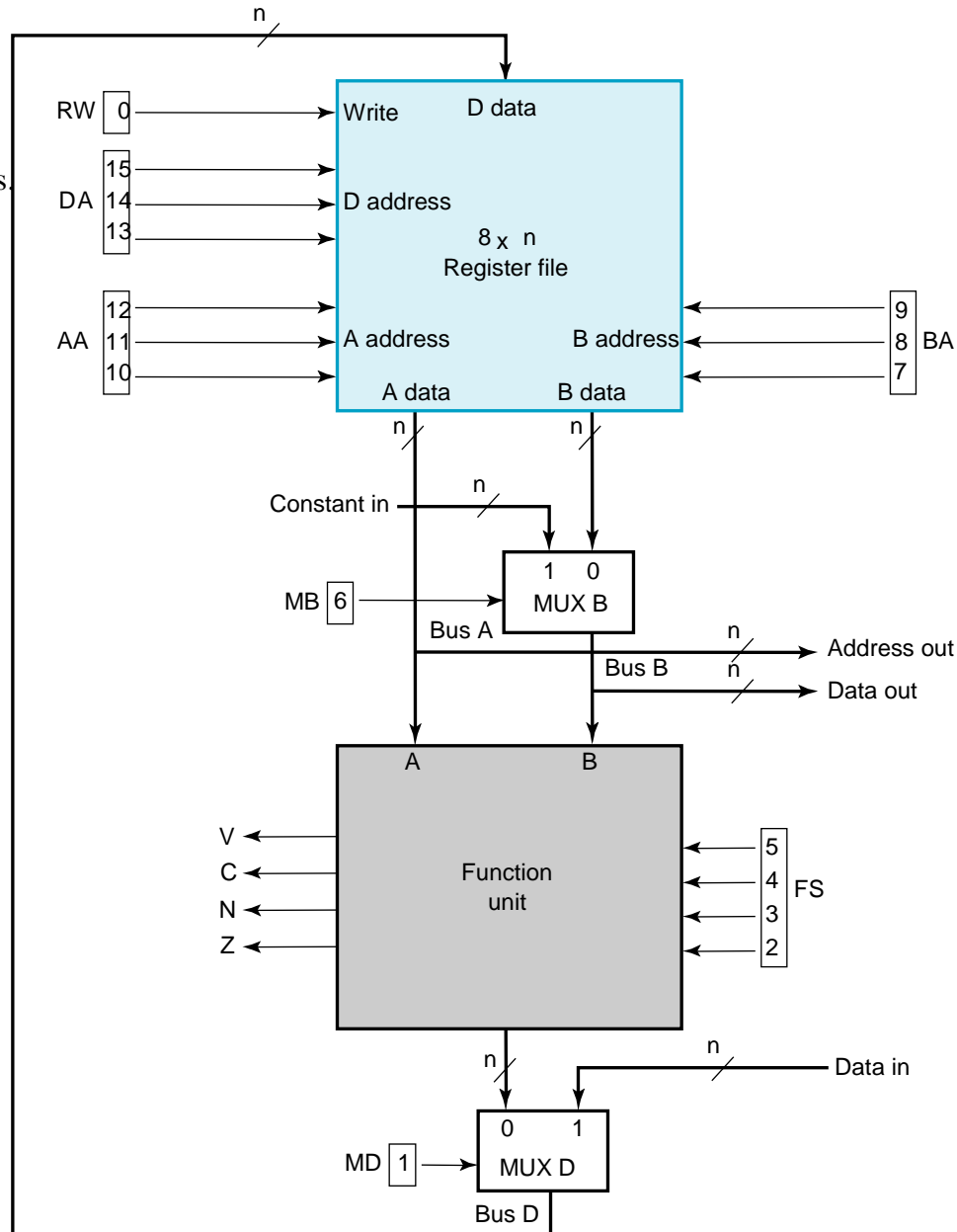


Figure 4. Datapath

**Question 5 (3 Marks)**

1. Select the right answer to complete the statement

a. The control unit is responsible of .....

- Generating the sequence of control signals to execute the micro-operation.
- Executing the arithmetic and logic operation.

b. The program counter (PC) holds the.....

- Address of the next instruction in the memory.
- Address of the destination register.

c. The instruction decoder generates .....

- The instruction code.
- Control word.

2. Consider the following assembly program

```
LDI R1, 250
LD R2, (R1)
INC R1, R1
LD R3, (R1)
SUB R2, R2, R3
INC R1, R1
ST (R1), R2
```

Address

.....

250

251

252

Memory

.....

20

4

a. What is the value of memory cell that has the address 252 after executing this program?

b. What is the value of the status bits after executing the instruction (SUB R2, R2, R3 ) of the previous program

C	N	Z	V