

Name: Student ID:

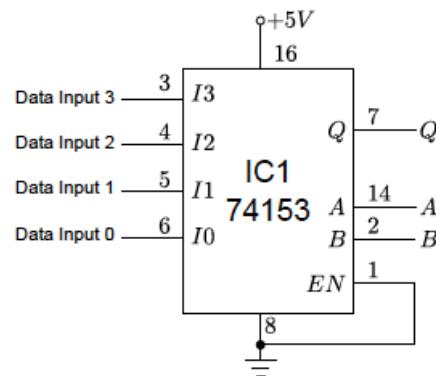
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Laboratory 9

Multiplexer and Demultiplexer

1. Multiplexer:

- 1.1 Connect a logic circuit as shown in the following figure. Data input, pin A and B shall be connected to the logic switches and pin Q to a logic monitor.



- 1.2 Supply the data input for pin DATA INPUT 0 to 3 as specified in the following table.
1.3 Supply the signal for pin A and B as specified in the following table. Observe and record the output Q and the corresponding match to data input channel.

Data Input				Control Input		Output (Q)	Match to Data Input
I ₀	I ₁	I ₂	I ₃	B	A		
1	0	1	0	0	0		
1	0	1	0	0	1		
1	0	1	0	1	0		
1	0	1	0	1	1		
0	1	0	1	0	0		
0	1	0	1	0	1		
0	1	0	1	1	0		
0	1	0	1	1	1		

Remark: EN=0

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1.4 Connect pin EN to +5V and redo the experiment 1.2-1.3. Record the results in the following table.

Data Input				Control Input		Output (Q)	Match to Data Input
I ₀	I ₁	I ₂	I ₃	B	A		
1	0	1	0	0	0		
1	0	1	0	0	1		
1	0	1	0	1	0		
1	0	1	0	1	1		
0	1	0	1	0	0		
0	1	0	1	0	1		
0	1	0	1	1	0		
0	1	0	1	1	1		

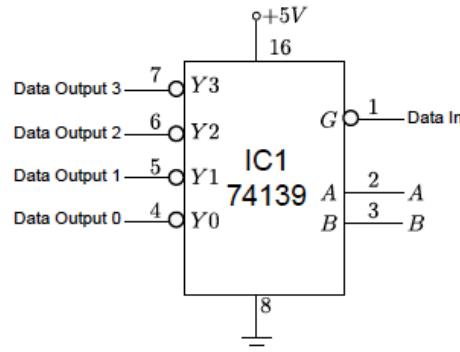
Remark: EN=1

1.5 Draw conclusions from the preceding experiment

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2. Demultiplexer:

2.1 Connect the circuit as shown in the following figure.



2.2 Connect the output pin DATA OUTPUT 0 to 3 to the logic monitor.

2.3 Supply the control signal for pin A, B, and the Data in to pin G according to the following table.

2.4 Observe and record the results.

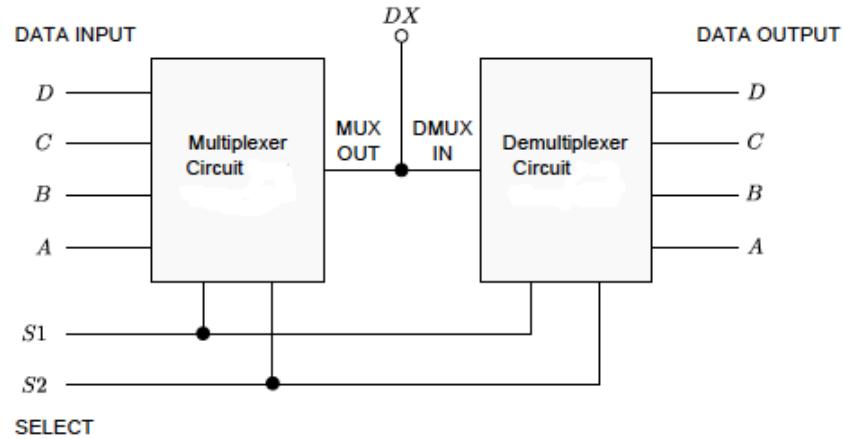
Input			Output			
Data In	B	A	Out3	Out2	Out1	Out0
1	0	0				
0	0	1				
0	1	0				
1	1	1				
0	0	0				
1	0	1				
1	1	0				
0	1	1				

2.5 Draw conclusions from the preceding experiments.

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3. Multiplexer-Demultiplexer:

3.1 Connect the circuit as shown in the following figure



3.2 Supply the data to DATA IN 0 to 3 as specified in the following table.

3.3 Connect DATA OUTPUT 0 to 3 to the logic monitor where DATA OUTPUT 3 is MSB.

3.4 Connect pin A and B of IC1 and IC2 (represented by S₂ and S₁ respectively) to logic switches.

3.5 Supply the value to pin A and B as specified. Observe the result at pin DATA OUTPUT 0 to 3 and compare them to the data at DATA IN pin.

3.6 Observe and record the results in the following table

Data Input				Control Input		DX	Data Output			
D	C	B	A	S ₁	S ₂		D	C	B	A
1	0	1	0	0	0					
1	0	1	0	0	1					
1	0	1	0	1	0					
1	0	1	0	1	1					
0	1	0	1	0	0					
0	1	0	1	0	1					
0	1	0	1	1	0					
0	1	0	1	1	1					

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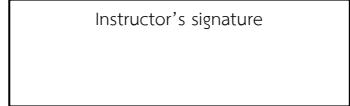
4. Assignments

- 4.1 A control room in a factory needs to monitor the status of four working machines. If the machine cannot function properly, an alarm signal of logic 0 will be sent to the control room. An operator comes and checks the alarm of the machines periodically (via control inputs). If there is alarm, the source of this alarm will be displayed and the operator can then take action. Construct a circuit using a multiplexer, a demultiplexer (encoder) and necessary gates, which gives outputs of alarm as states in the following conditions.
- Alarm signal of each machine is connected to a multiplexer. (I_3 to machine no.1, I_2 to machine no.2 , I_1 to machine no.3 and I_0 to machine no.4.)
 - Output signals are connected to a demultiplexer (encoder)

Source of Alarm	Output			
	Output3	Output2	Output1	Output0
Machine no. 1	0	0	0	1
Machine no. 2	0	0	1	0
Machine no. 3	0	1	0	0
Machine no. 4	1	0	0	0

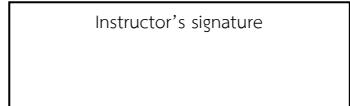
- Only two control inputs are available for the system

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- 4.2 Construct a circuit, which can compare two 4-bit binary numbers bit by bit using a multiplexer IC 74153. If both the inputs are the same, the output LED should be ON otherwise it should be OFF.

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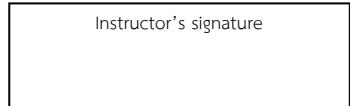


- 4.3 Realize the following function using IC 74138, a 3-to-8 line demultiplexer (decoder), and necessary gates

$$F_1(a,b,c) = m_0 + m_5 + m_7$$

$$F_2(a,b,c) = m_0 + m_1 + m_3$$

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Logic Diagram of frequently used gates