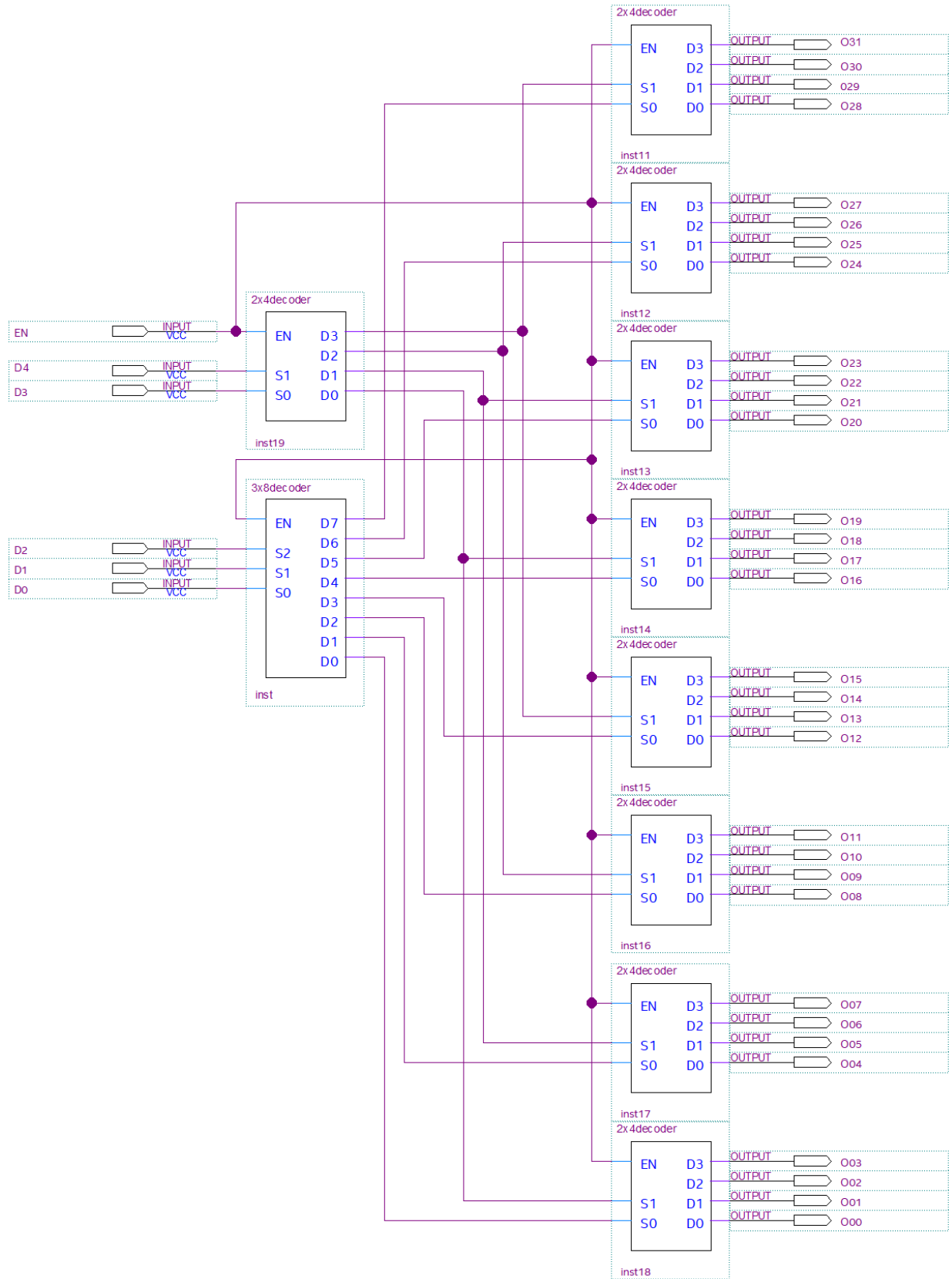# Homework 6
ECE2504 CRN:82729

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October 12, 2017

Question 1: (5 pts) Design a 5x32 decoder using 2x4 decoders with enable and one 3x8 decoder.
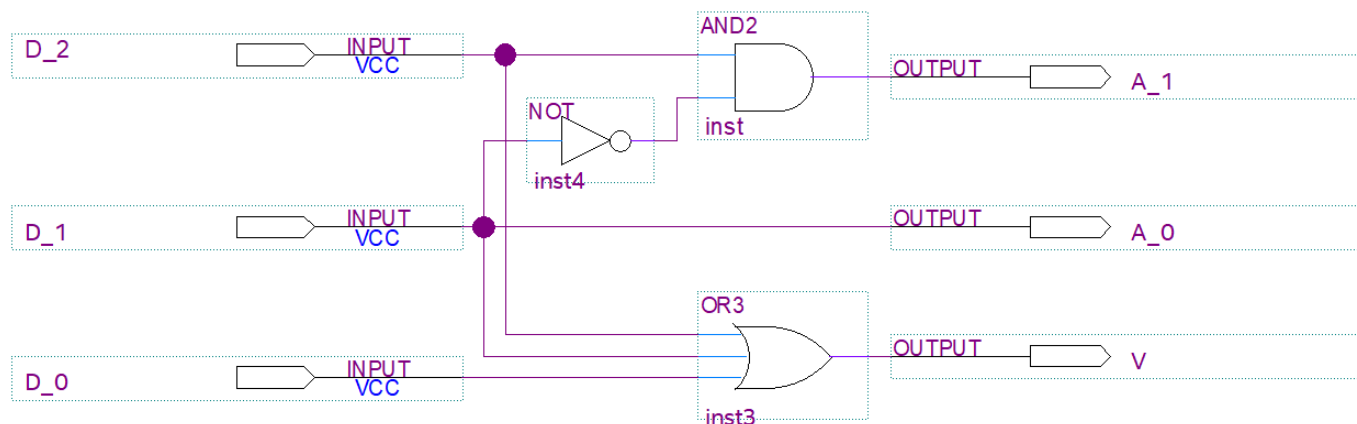
Question 2: (6 pts) Design a 3-input priority encoder with inputs and outputs as in the table below.

Inputs			Outputs		
D_2	D_1	D_0	A_1	A_0	V
0	0	0	X	X	0
0	0	1	0	0	1
X	1	X	0	1	1
1	0	X	1	0	1

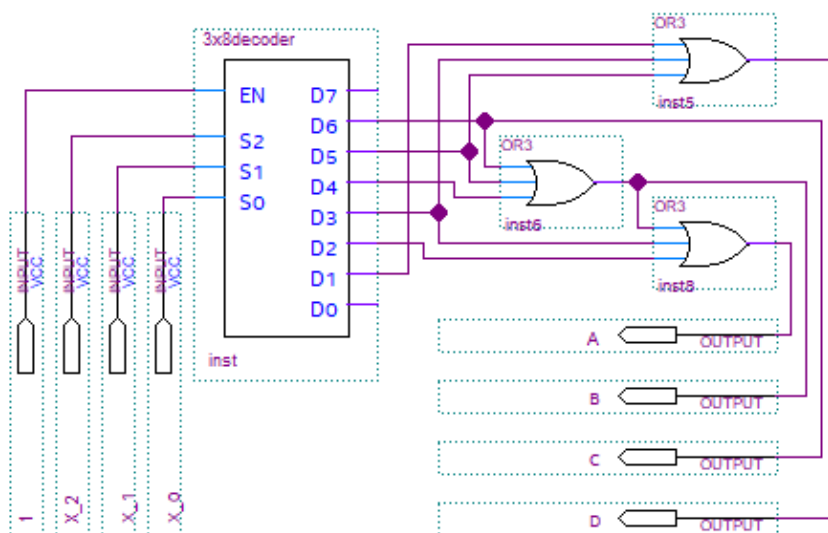$$A_1 = D_2\overline{D_1}$$
$$A_0 = D_1$$
$$V = D_2 + D_1 + D_0$$

Question 3: (8 pts) For the electronic game control circuit designed in HW5:Q3, implement a, b, c, and d using a 3x8 decoder and external OR gates. (Assume a maximum of 4 inputs for each gate.)

X_2	X_1	X_0	a	b	c	d
0	0	0	0	0	0	0
0	0	1	0	0	0	1
0	1	0	1	0	0	0
0	1	1	1	0	0	1
1	0	0	1	1	0	0
1	0	1	1	1	0	1
1	1	0	1	1	1	0
1	1	1	0	0	0	0

**Question 4:** (6 pts) Implement the Boolean function $F(A;B;C;D) = \Sigma(0;7;8;9;10;13;14;15)$

a) with an 8x1 multiplexer and a single inverter with variable D as its input.

A	B	C	D	F	
0	0	0	0	1	
0	0	0	1	0	$F = \overline{D}$
0	0	1	0	0	
0	0	1	1	0	$F = 0$
0	1	0	0	0	
0	1	0	1	0	$F = 0$
0	1	1	0	0	
0	1	1	1	1	$F = D$
1	0	0	0	1	
1	0	0	1	1	$F = 1$
1	0	1	0	1	
1	0	1	1	0	$F = \overline{D}$
1	1	0	0	0	
1	1	0	1	1	$F = D$
1	1	1	0	1	
1	1	1	1	1	$F = 1$
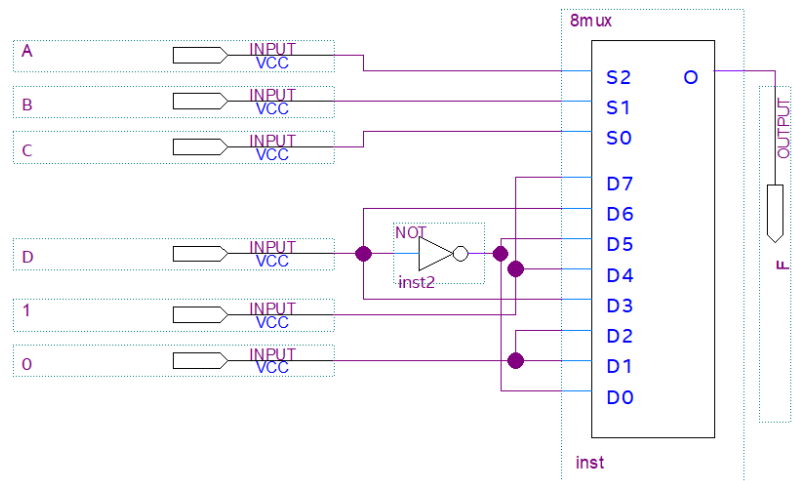
b) with a 4x1 multiplexer and 2-input logic gates with variables C and D as input.

A	B	C	D	F	
0	0	0	0	1	
0	0	0	1	0	
0	0	1	0	0	
0	0	1	1	0	$F = \overline{C + D}$
0	1	0	0	0	
0	1	0	1	0	
0	1	1	0	0	
0	1	1	1	1	$F = CD$
1	0	0	0	1	
1	0	0	1	1	
1	0	1	0	1	
1	0	1	1	0	$F = \overline{CD}$
1	1	0	0	0	
1	1	0	1	1	
1	1	1	0	1	
1	1	1	1	1	$F = C + D$
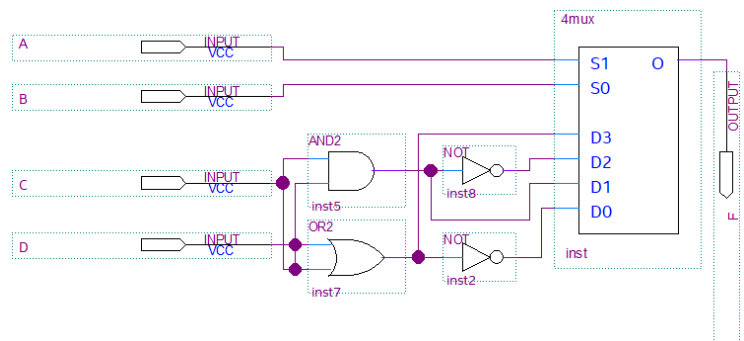
Question 5: (4 pts) define the following in your own words

a) Decoder: Outputs a 1-value to the pin specified by the input. i.e. $I = 011 \implies O = 00010000$

b) Encoder: Outputs the number of the pin supplying a 1-value. i.e. $I = 00010000 \implies O = 011$

c) Multiplexer Outputs the state of the pin specified by the selection pins. i.e.
$I = 0101; S = 01 \implies O = 1$

d) Demultiplexer Outputs the input state to the pin specified by the selection pins. i.e.
$I = 1; S = 10 \implies O = 0010$

GRADING SCALE

Total: 29 pts

Pts	0	3	7	11	15	18	22	25
Letter Grade	D-	D	C-	C	B-	B	A-	A