

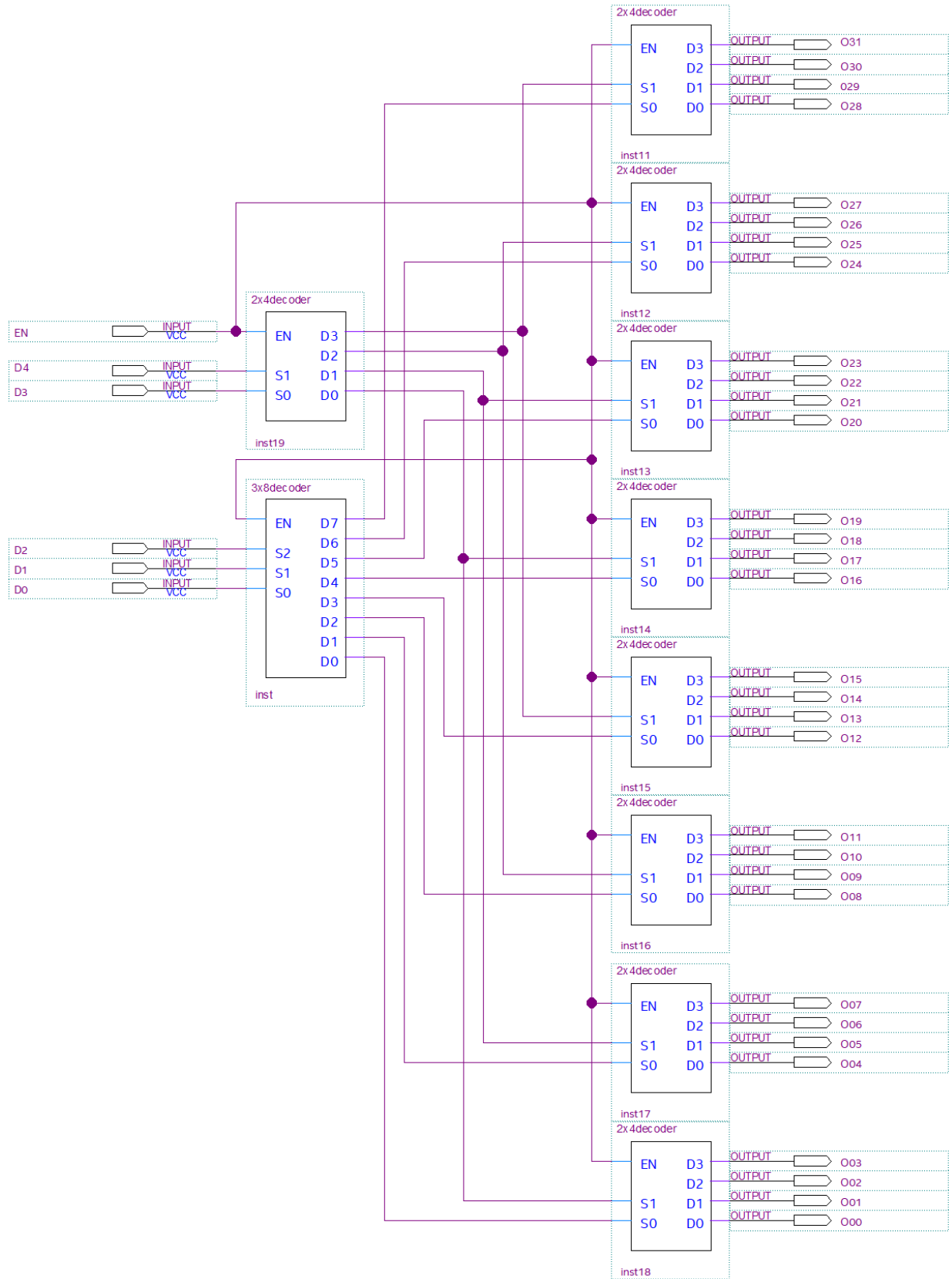
# Homework 6

ECE2504 CRN:82729

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**Question 1:** (5 pts) Design a 5x32 decoder using 2x4 decoders with enable and one 3x8 decoder.



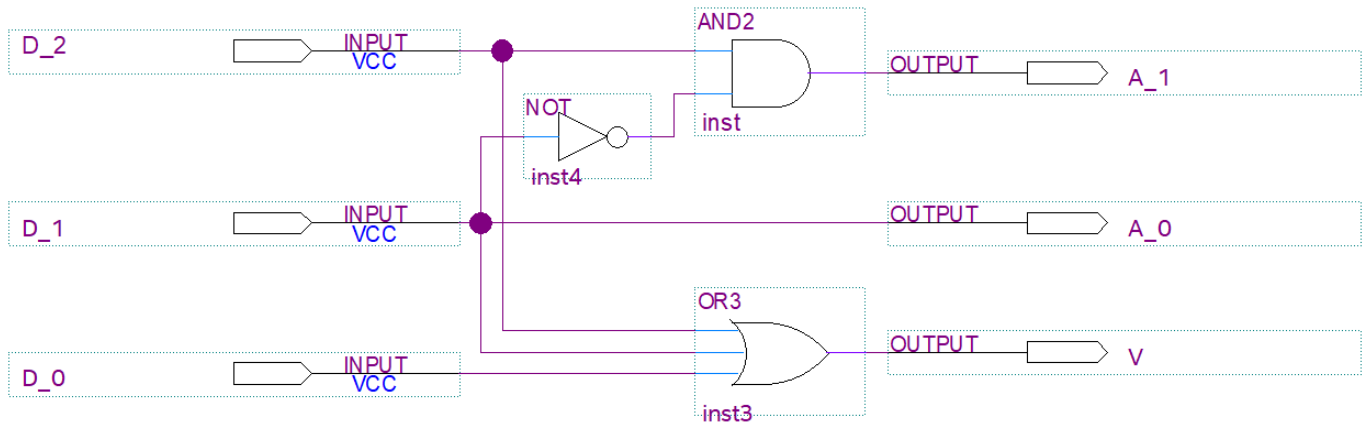
**Question 2:** (6 pts) Design a 3-input priority encoder with inputs and outputs as in the table below.

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

$$A_1 = D_2 \overline{D_1}$$

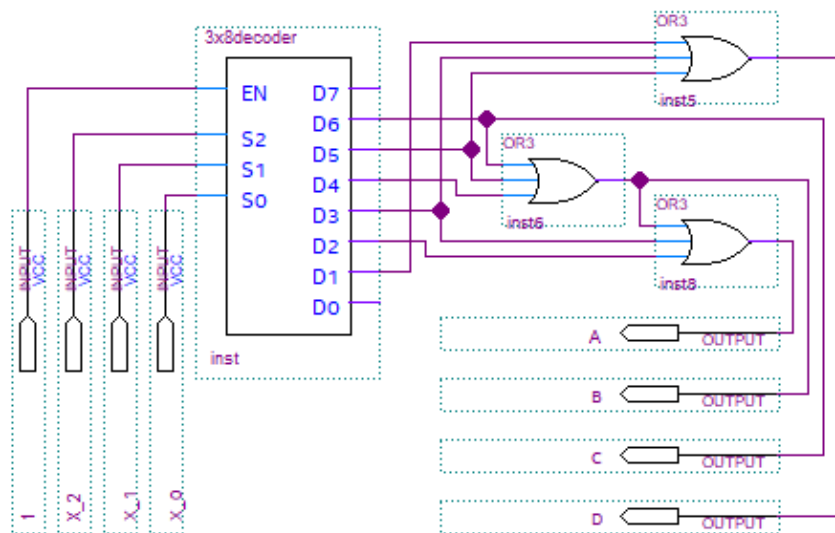
$$A_0 = D_1$$

$$V = D_2 + D_1 + D_0$$



**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.)

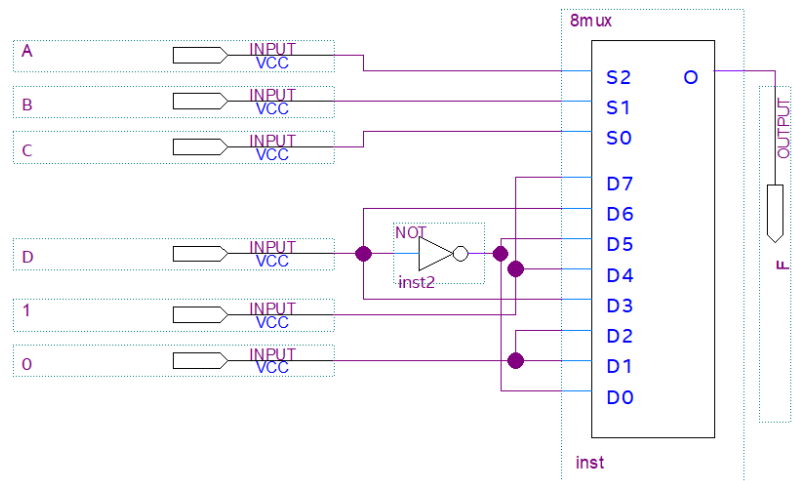
$X_2$	$X_1$	$X_0$	a	b	c	d
0	0	0	0	0	0	0
0	0	1	0	0	0	1
0	1	0	1	0	0	0
0	1	1	1	0	0	1
1	0	0	1	1	0	0
1	0	1	1	1	0	1
1	1	0	1	1	1	0
1	1	1	0	0	0	0



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

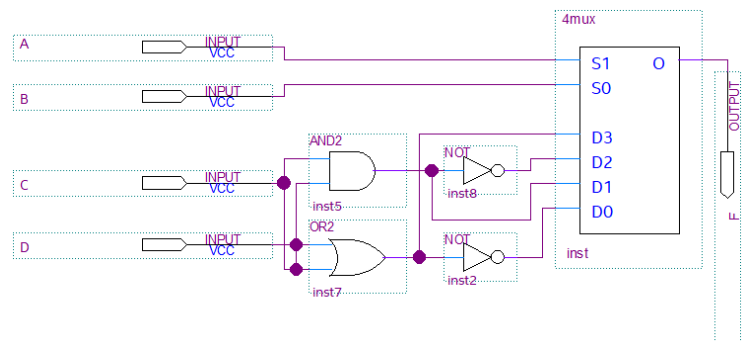
a) with an 8x1 multiplexer and a single inverter with variable D as its input.

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