Half-hour Examination #4 - 30 minutes
Closed Book, one 8.5x11" page of notes (double-sided)

NAME _____ Pilot ID: w_____ **SCORE** _____ / 20

Problem #1 [6]
Fill in the missing table entries! Convert the following numbers from the given representation to the other two representations listed in the table. Place your answers at the appropriate location in the table.

Decimal Integer	**Binary (8-bit twos complement)**	**Hexadecimal (8-bit twos complement)**
Example: 2	*Example: 0000 0010*	*Example: x02*
68		
	1110 1100	
		x1C

Problem #2 [5]
Perform the indicated operations using 6-bit 2s-complement binary numbers. Recall that the symbol '^' is bit-wise AND and the symbole 'v' is bitwise OR. Show your work if appropriate and circle the final 6-bit result produced for each computation. For subtraction operations, you can either subtract OR convert the subtractend into its 2s-complement inverse and add. For addition/subtraction operations, you must also CLEARY INDICATE if overflow occurs (OVERFLOW) or does not occur (NO OVERFLOW).

(a) 001110
+ 111101

(b) 001110
- 111101

(c) 100111
v 111001

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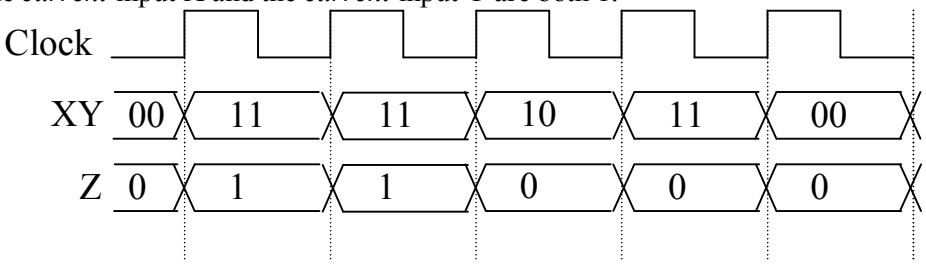
Problem #3 [3]

Consider a design for a clocked synchronous state machine with two synchronous inputs, X and Y, and one *mealy* output Z. The output Z should be 1 only if value of X at the *last* clock tick was equal to the value of Y at the last clock tick and the *current* input X and the *current* input Y are both 1.

Functional Timing Diagram:



Construct a minimal state diagram for this design. Label each state with an appropriate label. Clearly label your initial state (as INIT or START). Make certain that the mealy output value Z is defined for every input combination for every state.

Problem #4 [2]

How many states does this state machine need after minimization? CIRCLE ONE: **1** **2** **3** **4** **5**
Assume that the initial state is S0.

P.S.	**X=0**	**X=1**
S0	S0/1	S1/1
S1	S2/0	S3/0
S2	S0/0	S1/0
S3	S2/0	S4/0
S4	S2/0	S4/0

N.S./Z

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Problem #5 [4]
The following state table describes a sequential circuit with one synchronous input X and one **mealy** output Z. The initial state is 000.

Q2Q1Q0	X=0	X=1
000	000/0	011/0
001	110/1	000/1
010	000/0	011/0
011	010/1	001/1
110	001/1	111/1
111	001/0	111/1
	Q2*Q1*Q0*/Z	

Using the state assignments (Q2Q1Q0) defined above, determine the simplified equation for the next state of each state variable and the output Z. Use a minimum cost strategy (use don't care for any unused state assignments).

(a) [1 pt] Q2* =

(b) [1 pt] Q1* =

(c) [1 pt] Q0* =

(d) [1 pt] Z =

Show your work below this line

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DO NOT BEGIN UNTIL INSTRUCTED TO DO SO

HONOR CODE: Before the end of the examination, please sign:

In recognition of and in the spirit of the Wright State University policies of academic honesty, I certify that I have neither given nor received unpermitted aid in this examination.

Signature: _____

DO NOT BEGIN UNTIL INSTRUCTED TO DO SO
