

### Test 4

1. (20) For the following 5-variable problem, find BOTH minimum sum of products expressions.

	B C		0	
	00	01	11	10
D E				
00	X			1
01		1	1	1
11		X	X	1
10	X	1	1	1

	B C		1	
	00	01	11	10
D E				
00		1		
01	X			
11	X	1	1	
10	1			1

2. (20) For the following five-variable problem, find as many minimum sum of products expressions as you can. (5 points for each of the first three and 2 points each after that to maximum of 25) (7 terms, 22 literals)

	B C		0	
	00	01	11	10
D E				
00	1	1	1	
01	1	1	1	
11		1	1	
10			1	1

	B C		1	
	00	01	11	10
D E				
00	1		1	1
01	1		1	1
11		1	1	1
10	1			1

3. a) (10) For the following two functions, find the minimum sum of products expression for each (treating them as two separate problems).

	w x				
		00	01	11	10
y z					
00			1		
01					
11		1	1	1	1
10		1			1

f

	w x				
		00	01	11	10
y z					
00			1		
01		1	1	1	1
11			1	1	
10					

g

b) (20) For the same two functions, find a minimum sum of products solution (corresponding to minimum number of gates, and among those with the same number of gates, minimum number of gate inputs).

c) (10) Show a two level NAND gate implementation of the solution to part b. (This requires 6 gates and 17 gate inputs.)

4. (20) For the following three functions, find a minimum sum of products solution (corresponding to minimum number of gates, and among those with the same number of gates, minimum number of gate inputs. (This requires 11 gates and 31 gate inputs.) (Extra map in case you need it)

	a b				
		00	01	11	10
c d					
00		1		1	1
01				1	1
11				1	1
10					1

f

	a b				
		00	01	11	10
c d					
00					
01		1	1		
11				1	1
10		1	1	1	1

g

	a b				
		00	01	11	10
c d					
00			1		
01		1	1		1
11		1	1	1	1
10			1		1

h