

Name: _____

Read each question carefully before answering. Answer all parts. Show all work, calculations, and/or reasoning, otherwise no points will be awarded. Properly labeled loops must be shown on K-maps. Assume that you have access to gates with as many inputs as you need to create minimum cost circuits. Point values are as indicated.

1. $F(A, B, C) = \Sigma m(0, 1, 3, 4, 6)$

(a) (5 points) Using a K-map, find the minimum SOP expression.

	<i>A</i>	
<i>BC</i>	0	1
00		
01		
11		
10		

$F_{SOP} =$ _____

(b) (5 points) Draw the circuit diagram.

(c) (5 points) Determine the number of gates and inputs in this circuit:

Gates: _____

Inputs: _____

(d) (5 points) Find the minimum POS expression.

$F_{POS} =$ _____

(e) (5 points) Draw the circuit diagram.

(f) (5 points) Determine the number of gates and inputs in this circuit:

Gates: _____

Inputs: _____

(g) (5 points) Draw the circuit diagram of the equivalent NAND-NAND expression.

2. $F(A, B, C, D) = \Pi M(0, 3, 4, 8, 9, 10, 14)$

(a) (5 points) Using a K-map, find the minimum SOP expression.

	AB			
CD	00	01	11	10
00				
01				
11				
10				

$F_{SOP} =$ _____

(b) (5 points) Draw the circuit diagram.

(c) (5 points) Determine the number of gates and inputs in this circuit:

Gates: _____

Inputs: _____

(d) (5 points) Find the minimum POS expression.

$F_{POS} =$ _____

(e) (5 points) Draw the circuit diagram.

(f) (5 points) Determine the number of gates and inputs in this circuit:

Gates: _____

Inputs: _____

(g) (5 points) Draw the circuit diagram of the equivalent NOR-NOR expression.

3. Use the Quine-McCluskey method to find the minimum SOP expression for the following expression. Each column containing implicants is worth 5 points. The Prime Implicant table is worth an additional 5 points.

$$F(A, B, C) = \Sigma m(1, 3, 4, 5)$$

Column 1	Column 2	Column 3

Prime Implicants

- (a) (5 points) Write the minimum SOP expression.

$$F_{SOP} = \underline{\hspace{15em}}$$

4. Use the Quine-McCluskey method to find the minimum SOP expression for the following expression. Each column containing implicants is worth 5 points. The Prime Implicant table is worth an additional 5 points.

$$F(A, B, C, D) = \Sigma m(0, 2, 8, 9, 10, 11)$$

Column 1	Column 2	Column 3	Column 4

Prime Implicants	

- (a) (5 points) Write the minimum SOP expression.

$$F_{SOP} = \underline{\hspace{15em}}$$

5. $F(A, B, C, D) = \Sigma m(1, 3, 4, 5, 7, 13)$

(a) (5 points) Draw the minimum SOP circuit.

(b) (5 points) Draw the equivalent NAND-NAND circuit.

(c) (5 points) Draw the equivalent OR-NAND circuit.

(d) (5 points) Draw the equivalent NOR-OR circuit.