

Fall 2021 EHB 205E Midterm 1 Prof. Berna Örs Yalçın/Asst. Prof. Ahmet Erten/Asst. Prof. Tankut Akgül			Time 100min
Date: 19.11.2021	Total questions: 4	Total points: 100	
Student ID:	Name:	Signature:	

Question:	1	2	3	4	Total
Points:	10	45	25	20	100
Score:					

Instructions: Explain all steps clearly.

1. Find the numbers shown by ?

5

(a) $(AE.35)_{16} = (?)_8$.

5

(b) $(10100.101)_2 = (?)_{10}$.

10

2. (a) Reduce the following Boolean expression to minimum number of literal by using Boolean algebra axioms and theorems.

$$A'B(D' + C'D) + B(A + A'CD)$$

10

(b) Find the canonical sum of products (SOP) representation of the function

$$F(A, B, C, D) = B'D + A'D + BD$$

10

(c) What is the complement of the expression $F = (x' + y + z')(x + y')(x + z)$?

15

(d) Draw the logic diagram of the function $F(x, y, z) = x'y + z(x + y)$. Use the function as given in the question, do not find any other representation of it. What is the number of literals (L)?

3. For the function $G(w, x, y, z) = \Pi(1, 6, 7, 10, 11, 12, 13) + \Pi_d(0, 2, 4, 8, 9)$

15

(a) Find the minimal product of sums (POS) representation of function G using Quine-McCluskey method with coverage table.

10

(b) Find the minimal sum of products (SOP) representation of function G using Quine-McCluskey method with Petrick's method.

10

4. (a) Find the minimal sum of products (SOP) representation of function F given below using a Karnaugh map only.

$$F(a, b, c) = \Pi_M(4, 5, 6)$$

10

(b) For the F function given above and a function G(a,b,c), the following equation holds.

$$F.G = a'b'c' + bc$$

Find the product of sums (POS) representation for the minimal possible Boolean function G using a Karnaugh map only.

3. For the function $G(w, x, y, z) = \Pi(1, 6, 7, 10, 11, 12, 13) + \Pi_d(0, 2, 4, 8, 9)$

- (a) Find the minimal product of sums (POS) representation of function G using Quine-McCluskey method with coverage table.

	w	x	y	z		w	x	y	z
✓ 0	0	0	0	0	0,1	0	0	0	-
✓ 1	0	0	0	1	0,2	0	0	-	0
✓ 2	0	0	1	0	0,4	0	-	0	0
✓ 4	0	1	0	0	0,8	-	0	0	0
✓ 8	1	0	0	0	1,9	-	0	0	1
✓ 6	0	1	1	0	2,6	0	-	1	0
✓ 9	1	0	0	1	2,10	-	0	1	0
✓ 10	1	0	1	0					
12	1	1	0	0					
7	0	1	1	1					
11	1	0	1	1					
13	1	1	0	1					