EE1005 – Digital Logic Design Assignment # 1

Spring 2024

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| **Maximum Marks:** 35 | **Due Date:** 23 February 2024 @ 4 PM |

**Instructions:**

* Late submissions are not allowed.
* Clearly indicate all the calculations in your solution. No points will be awarded in case of missing calculations.

# Q # 1 (5 marks)

Simplify the following Boolean Functions to minimum possible number of literals.

a) xyz + 𝑥̅y + xy𝑧̅

b) (A+B)(A+B`)(A+C)(A+C`)

c) AC’D’ + A’C + ABC + AB’C + A’C’D’

d) (𝐴′ + 𝐵)’ (𝐴′ + 𝐶′)’ (𝐴𝐵′𝐶)’

e) A’B’D + A’C’D + BD

# Q # 2 (5 marks)

Simplify the following Boolean functions T1 and T2 to a minimum number of literals.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **T1** | **T2** |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 0 |

# Q # 3 (5 marks)

For the Boolean function

F=A′ B ′CD ′+A ′BC ′ D+AB ′C ′D+ABCD ′

1. Obtain the truth table of F and draw the logic diagram, using the original Boolean expression.
2. Use Boolean algebra to simplify the function to a minimum number of literals and draw the logic diagram from the simplified expression.

# Q # 4 (5 marks)

Convert each of the following expressions into sum of products (SOP) and product of sums (POS):

1. (A+B+C)(A`+B`+C`)(A+B`+C)
2. x’ + x(x + y’)(y + z’)
3. w(x + y + z) + xyz
4. X’ + X (X + Y’) (Y+Z’)

# Q # 5 (10 marks)

Perform the subtraction using 𝑟’s and 𝑟 − 1’s complement for the following numbers.

1. (9*A*7*B*)16​−(2*C*3*D*)16
2. (1111 1101)2 − (11001)2

# Q # 6 (5 marks)

Perform the BCD addition for the following BCD numbers.

1. (98765)10 + (12345)10
2. (45678)10 + (98765)10

**Q # 7 (2 + 3 + 5 + 5 + 5 = 20 marks)**

Simplify the following Boolean Functions by using Boolean algebra.

a) F (x, y, z) = ∑ (3, 6, 7)

b) F (x, y, z) = ∑ (1, 3, 4, 5, 6, 7)

c) F (w, x, y, z) = ∑ (3, 7, 11, 12, 13, 14, 15)

d) F (w, x, y, z) = ∑ (2, 3, 12, 13, 14, 15)

e) F (w, x, y, z) = ∑ (1, 3, 4, 5, 6, 7, 9, 11, 13, 15)