



United International University (UIU)
Department of Computer Science and Engineering
CSE 1325: DIGITAL LOGIC DESIGN, Midterm Spring 2024

Total Marks: **30** Duration: 1 hour 30 minutes

[Any examinee found adopting unfair means including copy from another examinee will be expelled from the trimester/program as per UIU disciplinary rules.]

Answer All Questions

1.	<p>A) Suppose there is a number system with base x. In that number system the following equation is true. Find out the value of x/radix.</p> $\frac{(126)_x}{(5)_x} = 21$ <p>B) Represent the numbers $(690)_{10}$ and $(1000)_8$ in BCD, and then show the steps necessary to form their sum in BCD.</p>	[2] [3]
2.	<p>A) Convert the following expression to both SOM and POM.</p> $F(A, B, C, D) = A'B + BD' + B'C'D + ACD'$ <p>B) Simplify the following function to 4 literals</p> $F(A, B, C, D) = (AB + C')(AB + D') + (C + D)(A + B) + BD'$	[2] [3]
3.	<p>For the following function:</p> $F(A, B, C, D) = \prod_M(0, 1, 3, 7, 8, 9, 11) + \sum_d(12, 13, 14, 15)$ <p>(i) Find the sum-of-product (SOP) form. (ii) Find the product-of-sum (POS) form. (iii) Which of the forms of between (a) and (b) will you choose to implement the function and why?</p>	[5]
4.	<p>Simplify the following Boolean function by finding:</p> <p>(i) all prime implicants (ii) essential prime implicants and (iii) applying the selection rule:</p> $F(A, B, C, D) = \sum_m(1, 3, 4, 5, 9, 14) + \sum_d(7, 8, 12)$	[5]

5.	<p>A three-variable logic function that is equal to 1 if any two or all three of its variables are equal to 1 is called a three input majority function.</p> <p>(i) Draw the truth table of the majority function. (ii) Draw the k-map of the function. (iii) Find the simplified product-of-sum (POS) form. (iv) Draw the circuit diagram of the expression found in (iii).</p>	[5]
6.	<p>Suppose you decided to adopt a kitten. The kitten needs to be fed once every three hours. However, due to your busy schedule throughout the day, you require an alarm system to remind you to feed the kitten. Using all the knowledge you gained from your DLD course you decided to build a circuit for an alarm system and connect it with your table clock. The system takes the binary value of the time from the clock as 4 bit input. Considering that the first alarm is set at 3 o'clock, the system subsequently rings every three-hour interval. Remember the alarm clock only provides the numbers from 1 to 12 as inputs. Map the other inputs of your circuits as don't care conditions. The circuit outputs 1 for the alarm to be rung.</p> <p>You have to (i) Show the truth table (ii) Find the simplified expression for the output bit in Sum-of-Product form (iii) Implement the simplified expression in PLA.</p> <p>Few example inputs and outputs are given below: Input : 0011, Output: 1, 3 o'clock so the alarm should ring Input : 0101, Output: 0, 5 o'clock so the alarm should not ring Input : 0110, Output: 1, 6 o'clock so the alarm should ring Input : 0000, Output: X(don't care)</p>	[5]