



PRINCE OF SONGKLA UNIVERSITY  
FACULTY OF ENGINEERING

Examination : Mid - Session 2                              Year : 2002  
Date : 28 December 2002                              Time : 9.00-12.00  
Subject : 240-233 Principles of Digital Systems      Room : A401

**NOTE**

- There are 8 questions. Answer all questions
- All questions are of different values.
- Calculator, textbooks and hand-out are prohibited.
- Every answer must be clear and show how to get the answer.
- All answers must be given in ink.
- Unless otherwise indicated, pencils should only be used for graphical work.

Student ID : \_\_\_\_\_ Name : \_\_\_\_\_ Section : \_\_\_\_\_

Question	1	2	3	4	5	6	7	8
Scores								

1. Which of the following arithmetic operations are correct? Explain your answers. If the answer is incorrect, show the correct answer.(12 marks)

(a) The numbers are all expressed in a 2's complement representation using 5 bits plus a sign bit.

$$\begin{aligned} N1 &= 110100 \\ N2 &= 101011 \\ -N2 &= 010101 \\ N1+(-N2) &= 101001 \end{aligned}$$

Answer \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(b)  $-25.25_{10} = 11100111.01$ (2's complement representation)

Answer \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(c)  $01100111_{BCD} + 01011001_{BCD} = 100100000_{BCD}$

Answer \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



3. Convert the expression  $\overline{AC}(\overline{ABD}) + \overline{ABC}\overline{D} + \overline{ABC}$  to standard product - of - sum (POS) forms. (4 marks)

Answer \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Determine  $t_{PLH}$  and  $t_{PHL}$  from the oscilloscope display in Figure 1. The readings indicate V/div and sec/div for each channel. (2 marks)

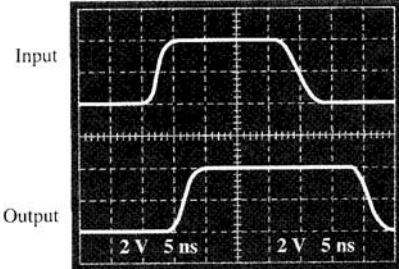


Figure 1

Answer \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



6. Use Karnaugh map to simplify the expression (2 marks)

$$X = \overline{A}B\overline{C}D + A\overline{B}C\overline{D} + \overline{A}B\overline{C}D + \overline{A}B\overline{C}D + \overline{A}B\overline{C}D + A\overline{B}C\overline{D} + A\overline{B}C\overline{D} + A\overline{B}C\overline{D}$$

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7. Determine the input conditions needed to cause the output in Figure 3 to go to its active state. (3 marks)

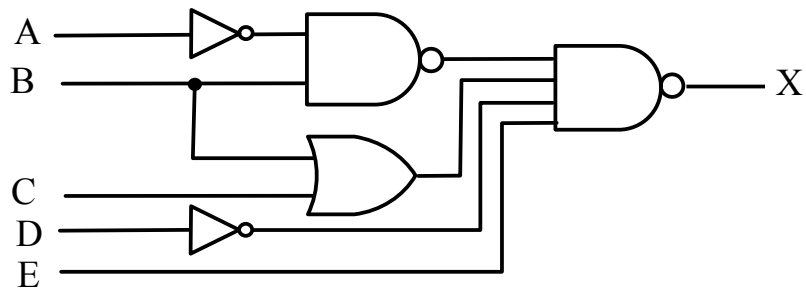


Figure 3

Answer

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Student ID : \_\_\_\_\_ Name: \_\_\_\_\_ 8

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