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 queations 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									

Student ID: Name: 1
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.
N1 = 110100 N2 = 101011 -N2 = 010101
N1+(-N2) = 101001
Answer
(b) $-25.25_{10} = 11100111.01(2)$ complement representation)
Answer
(c) $01100111_{BCD} + 01011001_{BCD} = 100100000_{BCD}$
Answer

Student ID:	Name:	2
2. Answer the follo	owing questions decimal number 23.125 into oct	(12 marks)
(b) Multiply the	e 2' Complement number : 01010	011 x 1100101
Answer		
() 5: 1.1.2		201 20101001
(c) Divide the 2 Answer	2' Complement number : 100010	001 ÷ 00101001

3. Convert the expression $\overline{AC}(\overline{\overline{ABD}}) + \overline{ABCD} + \overline{ABCD}$ 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)

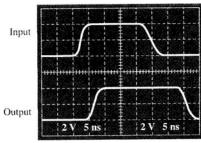


Figure 1

Answer

Student ID :	Name:	4
5. Using Figure 2 t B A C	o answer the following questions.	
(a) Simplify tl	Figure 2 ne circuit using Boolean algebra	
Answer		
(b) Develop th	ne truth table	
Answer		

Student ID :	Name:	5

6. Use Karnaugh map to simplify the expression	(2 marks)
$X = \overline{A}B\overline{C}\overline{D} + A\overline{B}\overline{C}D + \overline{A}B\overline{C}D + \overline{A}\overline{B}CD + \overline{A}BCD + AB\overline{C}D + \overline{A}BCD + \overline{A}B$	$+ ABCD + ABC\overline{D}$

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

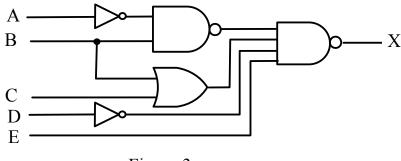


Figure 3

Answer			

- 8. Figure 4 represents a relative-magnitude detector that takes two two-bit binary numbers x_1x_0 and y_1y_0 and determines whether they are equal and, if not, which one is larger. There are three outputs, defined as follows:
 - a) M = 1 only if the two input numbers are equal
 - b) N = 1 only if x_1x_0 is greater than y_1y_0
 - c) P = 1 only if y_1y_0 is greater than x_1x_0

Design the logic circuit for this detector.

(15 marks)

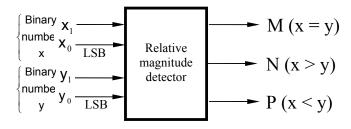


Figure 4

Student ID:	Name:	7

Student ID:	Name:	8