

Prince of Songkla University
Faculty of Engineering
Department of Computer Engineering

Mid -Term session 1

Date 1 August 2002

Subject 240-233 Principles of Digital Systems

Year 2002

Time 9.00-12.00

Room R201

- There are 8 questions. Answer all questions
- All questions are of difference values.
- Calculator, textbooks and hand-out are prohibited.
- Every questions must be clear and show how to get the answer.

NOTE

- All answers must be given in ink.
- Unless otherwise indicated, pencils should only be used for graphical work.

Question	1	2	3	4	5	6	7	8
Scores								

Section 1

1. Which of the following arithmetic operations are correct? Explain your answers. If the answer is wrong, the correct answer must be obtained. (12 marks)

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

$$N1 = 010100$$

$$N2 = 101011$$

$$-N2 = 010101$$

$$N1 + (-N2) = 101001$$

Answer _____

(b) $-25.25_{10} = 11100111.01$

Answer _____

(c) $248_8 = 2 \times 8^2 + 4 \times 8^1 + 8 \times 8^0$

Answer _____

2. Give the answer : (12 marks)

(a) Convert the decimal number 31.87 to numbers in octal bases

Answer _____

(b) Multiply the 2' Complement number : 01010011 x 11000101

Answer _____

(c) Divide the binary : 11010 ÷ 11.101

Answer _____

5. Using Figure 1 to answer the following questions (8 marks)

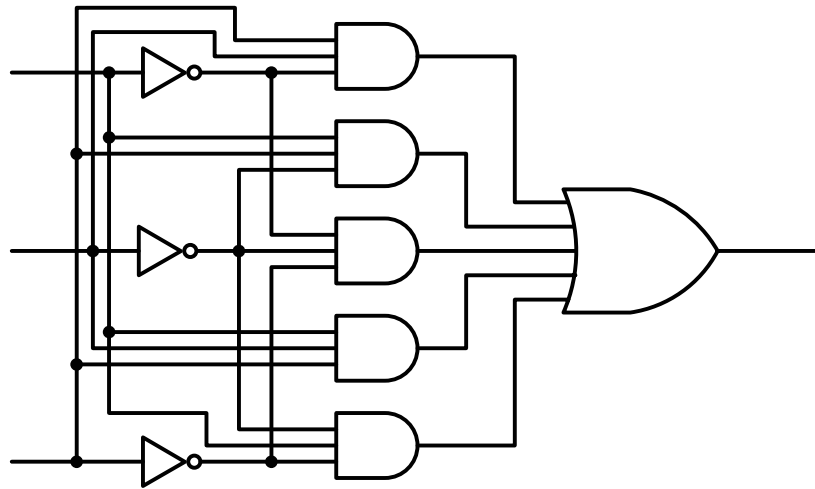


Figure1

(a) Simplify the circuit using Boolean algebra

A

(b) Develop the truth table

B

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

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

7. In a microcomputer, the microprocessor unit(MPU) is always communicating with one of the following: (1) random-access memory(RAM), which stores programs and data that can be readily changed; (2) read-only memory (ROM), which stores programs and data that never change; (3) external input/output devices (I/O) such as keyboard, video displays, printers and disk drives. As it is executing a program, the MPU will generate an address code that selects which type of device (RAM, ROM, or I/O) it wants to communicate with. Figure2 shows a typical arrangement where the MPU outputs an eight-bit address code A_{15} through A_8 . Actually, the MPU outputs a 16-bit address code, but the low-order bits A_7 through A_0 are not used in the device selection process. The address code is applied to a logic circuit which uses it to generate the device select signals: \overline{RAM} , \overline{ROM} and $\overline{I/O}$

(15 marks)

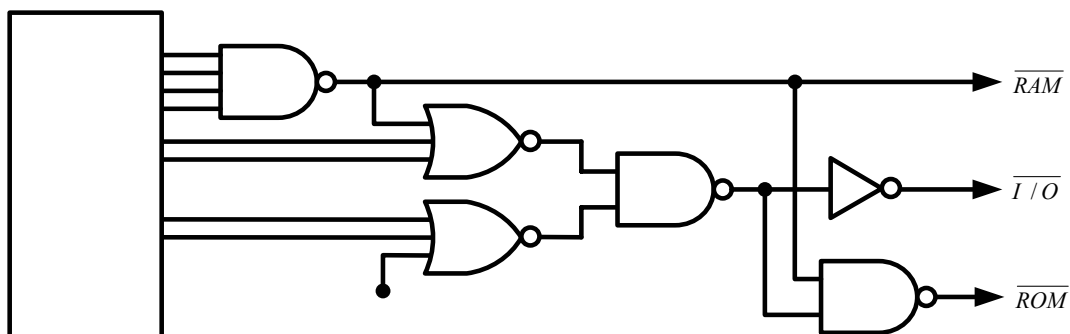


Figure 2

