MASSEY UNIVERSITY
PALMERSTON NORTH and ALBANY CAMPUS

EXAMINATION FOR 59.203 COMPUTER SYSTEMS

Semester 2
1997

Time Allowed: TWO (2) hours

ANSWER ALL QUESTIONS.

1. (a) A full adder adds two binary numbers A and B together and includes provision for a carry in bit Cin and a carry out Cout.
   (i) Give the truth-table for a full adder.
   (ii) Draw the circuit for a full adder.
   (iii) Show how you would construct a 4 bit full adder.

   [5 marks]

(b) A vending machine dispenses either tea or coffee, each costing $1. It has four input signals
   COIN which detects that the user has paid.
   TEA_REQ a button for tea
   COFFEE_REQ a button for coffee
   DRINK_DISPENSED which will signal that the drink is ready
   and two output signals
   DISP_TEA which will start dispensing a cup of tea
   DISP_COFFEE which will start dispensing a cup of coffee
   A $1 coin must be inserted before a drink can be requested.
   After the coin is inserted, the machine waits for a request of either tea or coffee.
   The output signal for the drink to be dispensed is a single pulse.
   The machine then waits until an input signal DRINK_DISPENSED is received.
   The cycle is then complete.

   Draw an ASM chart, and design the circuit for the vending machine.

   [5 marks]

Question 1 continued over... Turn over to p.2, etc...
Question 1 continued

The Pico-computer Architecture

(c) Describe how machine instructions are implemented on the Pico-computer, using as an example the LDA operand instruction to illustrate your answer.  

[5 marks]

2. Information about the 8051 instruction set can be found in tables at the end of the paper.

(a) Describe 4 different ways that parameters may be passed to subroutines.  

[4 marks]

(b) Write a program in 8051 assembler, that will output a string of characters (terminated with a NUL character) to an LCD display.

The address of the first character to output is held in the R1 register.

To display a character on the LCD:

Set the bit P3.5
Copy the character into the P1 parallel port
Clear the bit P3.5
delay for at least 100 cycles.

[6 marks]

(c) Describe how interrupts are handled by the 8051 microcontroller architecture.  

[5 marks]

Turn over to p.3, etc...
3. (a) Describe the modulation technique used to transmit data, at bit rates of 4800 and above, over telephone lines.  

   [5 marks]

(b) Two computers A and B are connected together by modems, and are using asynchronous communication, 7 data bits, 1 (even) parity bit, 1 stop bit.  

What parts of this setup are covered by the RS232 standard.  

   [1 mark]

There are two types of error that can be detected by the receiving UART, describe each of them.  

   [2 marks]

(c) Errors in transmission can be detected and corrected if a suitable encoding scheme is used. 11 bit Hamming codes are one way of protecting 7 bit ASCII, so that single bit errors can be corrected. If the following code is received 11100000110, what was the transmitted character (in binary)?  

   [2 marks]

(d) One method of allocating bit patterns to characters is by Huffman encoding. Describe how this is performed, and its advantages/disadvantages over ASCII.  

   [5 marks]

4. (a) What is the purpose of the BIOS? Illustrate your answer with examples of some of the functions it performs.  

   [7 marks]

(b) Describe the implementation of the DOS File System.  

   [8 marks]