

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
JUNE EXAMINATIONS 2004**

COURSE: MICROPROCESSORS AND EMBEDDED SYSTEMS
CODE: SCS 2202

INSTRUCTIONS TO CANDIDATES

This question paper consists of **Five** questions.
Answer **any four (4)** questions

3 HOURS

QUESTION ONE

- a) Describe fully the following MC6800 microprocessor signals.
- | | |
|------------------------------------|-----|
| i) READ/WRITE(R/W) | [4] |
| ii) VALID MEMORY ADDRESS (VMA) | [4] |
| iii) DATA BUS ENABLE (DBE) | [4] |
| iv) NON-MASKABLE INTERRUPT (NMI) | [4] |
- b) Write an MC 6800 source code for a routine that will determine how many of the bits in the given two data bytes, are different. [9]

QUESTION TWO

- a) Give a detailed IRQ sequence in an MC6800 microprocessor [8]
- b) Write an MC6800 program to convert hexadecimal numbers from \$1 to \$64, to decimal numbers from 1 to 100. Do this by setting a loop that subtracts 1 from the hexadecimal number while adding 1 to the decimal number, until the subtraction produces a zero result. Show a flowchart, source code, and comments. [12]
- c) State performance metrics for a microprocessor [3]
- d) What is the rationale behind the use of ALE signal in an 8085 microprocessor and in an Intel 8051 micro-controller? [2]

QUESTION THREE

- a) When executing a subroutine why is it desirable to save the machine registers by pushing them on the stack rather than by simply storing them to a selected RAM location [2]
- b) Why is a hardware debounce circuit required to drive the NMI input from a switch? [1]

- c) Draw the block diagram for the internal architecture of an 8051 micro-controller. [10]
- d) i) If a basic loop of a delay routine takes 20 microseconds, how many levels of nesting will be needed to produce a 36-hour delay assuming 8-bit registers [4]
 ii) Draw a flowchart showing the levels of nesting for this routine [6]
 iii) What are the factors determining the levels of nesting in any system? [2]

QUESTION FOUR

- a) Compare and contrast a microprocessor and a micro-controller [10]
 b) What are the benefits of using bus standards? [3]
 c) Explain and describe how a device driver operates. [4]
 d) What characteristics should a system have in order for it to be classified as an embedded system? [2]
 e) Write detailed notes on any six special function registers of an 8051 micro controller [6]

QUESTION FIVE

Figure 1 represents an automatic frequency-response plotter for an amplifier as a system with four devices interfaced by the IEEE-488 bus. The processor controls the frequency of the programmable function generator and feeds the frequency data to the horizontal axis of the plotter. A digital voltmeter monitors the amplifier output and feeds the vertical input of the plotter under processor control.

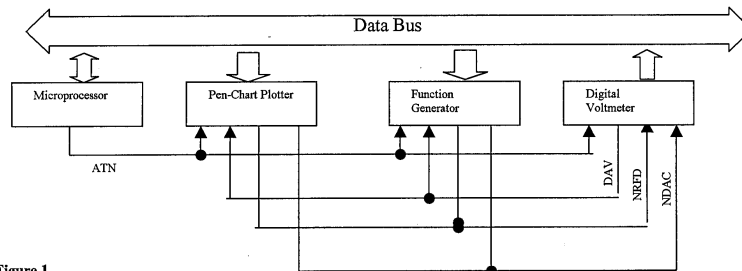


Figure 1

- a) In Figure 1 identify the four devices as controller, talker, or listener. [3]
 b) Explain in detail how the talker on an IEEE-488 bus decides when to assert new data and when to remove that data from the bus. [5]
 c) If a second controller is introduced into the above system, which signal lines, is it going to control? [3]
 d) Describe how the second controller will take over the bus from the active controller. [5]
 e) How does an 8051 micro-controller identifies the type of memory it is addressing [3]
 f) Draw a pin out diagram of an MC6800 microprocessor [6]

END OF QUESTION PAPER

GOOD LUCK