

## CCE 2002 – Microprocessor Systems

**Department of Communications and Computer Engineering  
University of Malta**

### *Tutorial I*

- 1) Describe the basic components that make up a complete computer system.
- 2) A microcomputer has a three bus system, discuss the function of each system with reference to the 8086/8088.
- 3) The 8086 has a multiplexed address/data bus, explain how this system is implemented. Indicate also the timing requirements.
- 4) The 8086 CPU contains two independent units, which together control the functioning of the microprocessor. By using an appropriate block diagram, discuss the function of each unit.
- 5) The fetch and execute cycle of the 8086 overlap, explain how this is performed and compare this cycle to a non-pipelined architecture.
- 6) Outline the main differences between the 8086 and the 8088.
- 7) The 8086 CPU has several general purpose registers and pointers. List these registers and indicate their main functions.
- 8) The flags register is a special type of register. Draw a diagram of this register and describe the function of the used bits.
- 9) If register AL contains 6Eh and the instruction ADD AL, 24h is executed, what will AL and the Flags register contain?
- 10) If register AX contains 6FFEh and the instruction ADD AX, 1002h is executed, what will AX and the Flags register contain?
- 11) If register AL contains 91h and the instruction SUB AL, 14h is executed, what will AL and the Flags register contain?
- 12) If register AX contains 810Dh and the instruction SUB AX, 101Fh is executed, what will AL and the Flags register contain?
- 13) The 8086 has 20 lines to address 1M bytes of memory. Explain how this memory is divided and what will happen if a word starting at an odd address needs to be read.
- 14) By using a block diagram, describe the principle of segmented memory. Explain also the requirement of segment registers and outline the function of the four segments used by the program.

- 15) What is the difference between a physical address and a logical address?  
Explain how the physical address is obtained from a logical address.
- 16) Calculate the physical address of the following:
- Segment base value B186h, offset 0128h
  - Segment base value 1245h, offset 1274h
  - CS: 682Bh, IP: 0624h
  - DS: 782Dh, SI: 1022h
  - ES: 882Eh, DI: 0442h
  - SS: 5828h, SP: 0028h
- 17) Each instruction that references memory uses a default segment register. These default segment registers are programmed in the BIU in the form of a table. Give an example of such a table.
- 18) Using assembly language, define a data segment labelled `table_1` and a code segment labelled `codeseg_1`. Note that the instructions in `codeseg_1` require access to the `table_1` information.
- 19) Outline that advantages and disadvantages of segmented memory.
- 20) Describe the function of the stack.
- 21) Given that the SS register is pointing at location 1A12h, SP register contains 002Ch, AX register contains 2567h, and BX contains B289h; indicate the address of the bottom of the stack and the address of the top of the stack. If the instruction `PUSH AX` followed by instruction `PUSH BX` are executed, calculate the new value of SP and using a diagram indicate how the values of AX and BX will be stored in memory.
- 22) Given that the SS register is pointing at location 28A4h, SP register contains 0154h, location 28B94h contains 31DFh, and 28B96h contains AF34h; indicate the address of the bottom of the stack and the address of the top of the stack. If the instruction `POP AX` followed by instruction `POP BX` are executed, calculate the new value of SP and the values of AX and BX.
- 23) Given that the SS register is pointing at location 6FDEh, SP register contains 0456h, AX register contains 8794h, BX contains DFA2h, and CX register contains 197Ah; indicate the address of the bottom of the stack and the address of the top of the stack. If the instruction `PUSH AX` followed by instruction `PUSH BX` followed by instruction `PUSH CX` are executed, calculate the new value of SP. After execution of a routine the following instructions are executed in sequence: `POP AX`, `POP BX`, `POP CX`. What are the values in SP, AX, BX, and CX?