

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: COMP 454

COURSE TITLE: MICROPROCESSOR INTERFACING

STREAM: Y4S2

DAY: TUESDAY

TIME: 2.00 – 4.00 P.M.

DATE: 22/03/2011

INSTRUCTIONS:

- *Answer Question ONE and any other TWO Questions. Question One carries 30marks while each of the other Two Questions carry 20marks.*
- *Additional material: The Z80 Instruction set.*

PLEASE TURN OVER

QUESTION 1 (30 marks)

- a) Perform the following arithmetic (4mks)
- $0CDFH + 0ABCH$
 - $00001010_2 - 00100011_2$
- b) State and explain two types of serial data communication. (2mks)
- c) Explain briefly the functions of the following register units in the Z80 microprocessor. (4mks)
- Stack pointer
 - Interrupt page address register
 - Instruction register
 - Index registers
- d) i) What is an interrupt? (1mk)
- State and explain any two interrupt inputs of the Z80 microprocessor (2mks)
 - State and explain any two modes of programming Z80 microprocessor to respond to interrupt (2mks)
- e) i) What is memory capacity? (1mk)
- A memory is marked 32K byte. Find the number of address line inputs. (3mks)
- f) Explain briefly what the following means: (2mks)
- Memory mapped input/output
 - Peripheral mapped input/output
 - State one advantage and one disadvantage of each of the input/output schemes in (i) and (ii) above (4mks)
- g) Differentiate between extended addressing and immediate extended addressing with reference to Z80 microprocessor. Write a short Z80 instruction example to illustrate the difference between the two addressing. (3mks)
- h) Explain why input / output devices cannot be interfaced directly to the microprocessor buses like memories. (2mks)

QUESTION 2 (20 marks)

- a) i) Differentiate between memory mapping and address/memory decoding (2mks)
- What is the function of the chip select logic within an address-decoding network? (1mk)
 - Differentiate between partial address decoding and full address decoding (2mks)

b) Consider the memory map shown

Address (Hex)	Device
0000 – 03FF	1K RAM
0400 – 0BFF	2K ROM
	Unused
F700 – F800	I/O
F801 – FFFF	2K EPROM

- i.) Outline the full address-decoding scheme based on the 2 to 4 decoder and additional logic gates that you feel are required. Assume that each device has one active high chip select input. (5mks)
- ii.) State the address range of the unused memory. (1mk)
- c) State and explain three constraints that determine the layout of the system memory map of a microprocessor (6mks)
- d) State three things that a microprocessor should do in order to communicate with a memory or I/O device. (3mks)

QUESTION 3 (20 marks)

- a) i) Differentiate between analogue interfacing and handshaking. (2mks)
ii) State and explain two types of interfaces. (3mks)
iii) State and explain two features that need to be considered when selecting an interface circuit (2mks)
- b) State and explain using instruction example in each case, the classification of Z80 instruction set sizes. (8mks)
- c) i) State and explain the three fields of assembly language program (3mks)
ii) State two rules to be followed in any named field in (i) above (2mks)

QUESTION 4 (20 marks)

- a) Define the following terms with reference to assembly language programming (4mks)
- i). Assembler
- ii). Loader

- iii). Interpreter
- iv). Monitor

b) Write an algorithm for adding even numbers between 40 and 60 for the Z80 microprocessor.

Develop your program as follows

- i.) Outline the steps followed. Use registers A, B and C (2mks)
- ii.) Assuming the first memory location is EBDDH; write the assembly language program to perform this operation using appropriate Z80 instruction set. Show also memory contents in hex codes. (5mks)
- iii.) Simply your program in (ii) using a flow chart (3mks)

c) i) Hand assemble the given assembly language program of Z80 microprocessor assuming that the first memory locations is 286CH. (5mks)

```

AND (IX+5)
LD A, (IY+6)
BIT 6, (IX+3)
LD IX, (2345H)
RES 3, B
RES 2, A
BACK: RES 3, (IX + 2)
SET 0, A
RLC (IY+2)
JP (BACK)

```

ii) What is the address of the SET instruction? (1mk)

QUESTION 5 (20 marks)

- a) i) What is direct memory access (1mk)
- ii) Name the four functional blocks within the 82C37A DMA. (2mks)

b) Name the method that can be used to synchronize the input or output information to a peripheral device (1mk)

c) Describe the functions of the following registers in 82C37A DMA (2mks)

- i). Base address register
- ii). Current address register

d) i) What is stack? How is it specified? (2mks)

ii) What is bus contention problem? How is this situation prevented? (2mks)

e) Consider the following assembly language program of a microprocessor-based system.

```
LD A, 80H
OUT (03H), A
START: LD A, 55H
      OUT (00H), A
      OUT (01H), A
      OUT (02H), A
      CALL (SUBTASK)
      LD A, AAH
      OUT (00H), A
      OUT (01H), A
      OUT (02H), A
      CALL (SUBTASK)
      JP (START)
SUBTASK: LD DE, FFBFH
        AGN: DEC DE
          LD A, E
          OR D
          JP NZ, (AGN)
          RET
```

- i.) Suggest what the first two instructions are doing (2mks)
- ii.) Name the labels used in this program and state their importance (2mks)
- iii.) Suggest what the whole program is doing (2mks)
- iv.) Hand assembles the above program showing only two columns of address and memory contents in hex codes. Assume the first memory location is 689EH. (4mks)