



MALAYSIAN INSTITUTE OF INFORMATION TECHNOLOGY

FINAL EXAMINATION
JANUARY 2016 SEMESTER

SUBJECT CODE : INB22603
SUBJECT TITLE : MICROPROCESSOR
LEVEL : BACHELORS
TIME / DURATION : 9.00am – 11.00am
(2 HOURS)
DATE : 29 MAY 2016

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consists of ONE (1) section. Section A.
4. Answer ALL questions in Section A.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English.

THERE ARE 7 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 100 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

a) Show the final content of AH, BL, and CL after the execution of the following code:

```

MOV BX, 03A1H
MOV AL, 20H
SUB BL, 10H
MUL BH
MOV CL, BL
SHL CL, 02H
AND CL, 10H
    
```

(8 marks)

b) List **THREE** (3) types of addressing modes used in 8086 assembly language.

(3 marks)

c) Figure 1 shows the general architecture of a Microcomputer system. Answer the following questions.

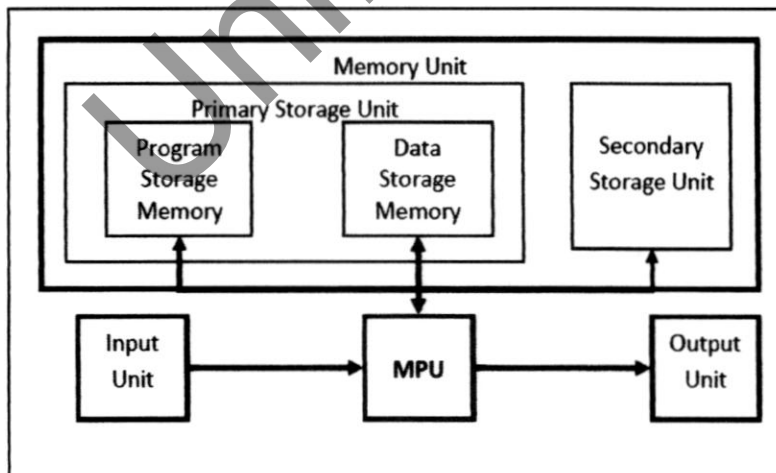


Figure 1

i. Explain the three main functions of MPU

(5 marks)

ii. Describe the Primary and Secondary Storage Unit

(5 marks)

d) Evaluate the following numbers. *Show your work.*

i. Convert 1100.11_2 to decimal

(2 marks)

ii. Convert binary 101011001_2 to BCD

(2 marks)

[Total: 25 marks]

Question 2

a) The initial state of the registers are AL=FFH, AH =BBH, BX=1013H, SS=0113H and SP=0004H. The initial stack memory is shown by Figure 2.

01130	01131	01132	01133	01134	01135	01136	01137	01138	01139
04	03	0A	4F	05	06	3E	A0	00	54

Figure 2

Compute the final content of **AX, BX, SP** and memory location **01130 through 01139** after the execution of the following code?

```
POP AX
POP BX
PUSH AX
PUSH AX
```

(10 marks)

b) Describe whether or not the jump happens in each code below:

i. TARGET: XOR CL, CL
 MOV CL, 05H
 SUB AL, AL
 SHL AL, CL
 JNC TARGET

(3 marks)

ii. TARGET: XOR CL, CL
 MOV 0BH, 65H
 MOV AL, 48H
 OR AL, 0BH
 SHL AL, 01H
 JC TARGET

(3 marks)

iii. TARGET: XOR CL, CL
 MOV 0AH, 55
 SUB DL, DL
 OR DL, 0AH
 MOV CL, 0AH
 AND CL, 0FH
 SHR DL, CL
 JNC TARGET

(3 marks)

c) Describe the following components in the internal architecture of 8086

i. Execution unit

(3 marks)

d) Produce an assembly language code for the below operation using **SHL**.

3 multiply by 100

(3 marks)

[Total: 25 marks]**Question 3**

a) Produce an assembly language program for the following pseudo-code:

i. $W := X + Y * Z;$

(3 marks)

ii. $Temp1 := (Y+Z)$
 $Temp2 := (A-B)$
 $Temp1 := Temp1 * Temp2$
 $X := Temp1 / 10$

(7 marks)

b) Calculate the value of X, Y, and Z of the physical addresses that follows. Assume all numbers are hexadecimal numbers. *Show your work.*

i. A000: $X = A0123$

(3 marks)

ii. Y:14DA = 235DA

(3 marks)

iii. D765: $Z = DABC0$

(3 marks)

c) Calculate the value of SI after the execution of the following code shown by Figure 3:

i. LEA SI , [DI + BX + 0AH]

DS	0100	01040	55
SI	F002	01041	A2
DI	0020	01042	68
AX	0003	01043	90
BX	0040	01044	DD
		01045	DF
		01046	12
		01047	34

Figure 3

(3 marks)

d) Calculate the value of AX after the execution of the following code shown by Figure 4:

i. ADD AX , [DI + BX + 2H]

DS	0106	0109C	55
SS	0200	0109D	A2
DI	0020	0109E	68
AX	0003	0109F	90
BX	0040	010A0	DD
BP	0040	010A1	DF
		010A2	12
		010A3	34

Figure 4

(3 marks)

[Total: 25 marks]

Question 4

- a) Let **num1=55667788** and **num2=11223344**. The numbers are stored at memory locations 200 and 300 respectively in the current data segment. Produce an assembly language code to *subtract num2 from num1* and store the result at memory location 400.

(5 marks)

- b) The value for the registers is shown below. Compute the following operation. *Show your work*
AL = 83H, BL = 41H, AH = 00H

i. IMUL BL

(3 marks)

ii. IDIV BL

(3 marks)

- c) Produce an assembly language code for the addition of the two hexadecimal digits **2** and **A** packed in register DL. The value of register DL is shown below:

d)

DL

2A

(4 marks)

- d) Analyse the program shown by Figure 5 and answer the following questions.

i. Explain the purpose of jump operation at line 012, 021 and 024.

(6 marks)

ii. Generate the output from the program

(4 marks)

```
001 [org 0x100]
002         jmp start
003
004 data:    dw 60, 55, 45, 50, 40, 35, 25, 30, 10, 0
005 swap:   db 0
006
007 start:  mov bx, 0
008         mov byte [swap], 0
009
010 loop1:  mov ax, [data+bx]
011         cmp ax, [data+bx+2]
012         jbe noswap
013
014         mov dx, [data+bx+2] ; load second element in dx
015         mov [data+bx+2], ax ; store first number in second
016         mov [data+bx], dx ; store second number in first
017         mov byte [swap], 1 ; flag that a swap has been done
018
019 noswap: add bx, 2 ; advance bx to next index
020         cmp bx, 18 ; are we at last index
021         jne loop1 ; if not compare next two
022
023         cmp byte [swap], 1 ; check if a swap has been done
024         je start ; if yes make another pass
025         mov ax, 0x4c00 ; terminate program
026         int 0x21
```

Figure 5

[Total: 25 marks]**END OF EXAMINATION PAPER**