FINAL
Examination Paper

(COVER PAGE)

Session : August 2014

Programme : Diploma In Information And Communication Technology (DICTN/DICTI)

Course : ICT2101/CSC2101 : Computer Organisation

Date of Examination : December 9, 2014

Time : 8:00am – 10:00am  Reading Time: Nil

Duration : 2 Hours

Special Instructions :

Answer any FOUR (4) questions.

Materials permitted : Nil

Materials provided : Nil

Examiner (s) : Mr. Ang Chee Huei, Steven Khoo Boo Tap.

Moderator : Mr. Mohammad Faizal Bin Alias

This paper consists of 6 printed pages, including the cover page.
INTI INTERNATIONAL COLLEGE SUBANG

DIPLOMA IN INFORMATION AND COMMUNICATIONS TECHNOLOGY
PROGRAMME (DICTN/DICTI)
ICT2101/CSC2101: COMPUTER ORGANISATION
FINAL EXAMINATION: AUGUST 2014 SESSION

Instructions: This paper consists of SIX (6) questions. Answer any FOUR (4) questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) The initial contents of registers of an 8086 processor are shown below:

AX=56ABH, BX=ABCDH, CX=A205H, DX=0100H, SI=7788H,
DS=4000H, SS=5000H, BP=4567H, SP=0108H, DI=1234H

Assume the memory location contains the data 45H for 8-bit operation and the data 4545H for 16-bit operation. With the aid of a diagram, show the actual physical address and the affected register content after the execution of the instruction below.

MOV CL, [BX+SI+12H]  

(b) Name and briefly describe the function of each of the THREE (3) system bus.

(c) Show the 20-bit 2's complement binary representation of the following decimals:

(i) 1,288  
(ii) -16,384  
(iii) 524,288

Question 2

(a) 8086 microprocessor was designed to have two separate working unit: Execution Unit (EU) and Bus Interface Unit (BIU), so that both unit can work concurrently and increase the efficiency of the processor. Describe THREE (3) situations in which either of the unit is forced to be idle waiting for the other unit.
(b) For the following program, determine the value of register AX when the program terminates. Explain your answer.

```
MOV CL, 00H
MOV AX, 1H
A2: ADD AX, 1H
    DEC CL
    JNZ A2
```

(5 marks)

(c) Write assembly codes that will calculate the average of the ten 16-bit numbers store at the data segment starting from address 0000H. Store the answer in register AX.

(11 marks)

**Question 3**

(a) Show all workings clearly for the following:

(i) Convert $2014_{10}$ to binary

(3 marks)

(ii) Convert $2014_{8}$ to hexadecimal

(3 marks)

(iii) Convert $2014_{16}$ to BCD (Binary Coded Decimal)

(3 marks)

(b) Modern CPUs have built-in cache to improve the performance of the computer system. Explain **TWO (2)** characteristics of computer programs that justified the inclusion of cache.

(8 marks)

(c) Explain the working principle of interrupt-driven I/O.

(8 marks)
Question 4

(a) Comment on the error if any, in the following assembly language mnemonics. Otherwise explain the outcome of the operation.

(i) ADC CL, [BX]
(ii) IN 49H, AL
(iii) INC [2014H]
(iv) XCHG [13H], [25H]
(v) MOV DS, 0700H

(10 marks)

(b) The following is output from the -r DEBUG commands after a certain 8086 program has run with a breakpoint set. All values are in hexadecimal.

AX=C846 BX=0184 CX=0020 DX=017C SP=0215 BP=0403 SI=7000 DI=6000
DS=2617 ES=12B4 SS=5487 CS=3C1A IP=0108 NV UP EI PL NZ NA PO NC
584A:010D 3007 ADC BH, DL

Answer the following questions:

(i) The logical address of the next instruction to be executed. (1 mark)

(ii) The physical address of the next instruction to be executed. (3 marks)

(iii) Identify the next instruction. Find the value of register BX and IP after the next instruction has been executed. (6 marks)

(iv) Provide the status flags (Carry, Auxiliary Carry, Zero, Sign and Parity) condition after next instruction being executed according to output from -t DEBUG command. (5 marks)
Question 5

(a) The following assembly instructions were executed in an 8086 computer:

\[
\begin{align*}
\text{MOV AX, } & \text{ 02}_H \\
\text{MOV DL, } & \text{ 03}_H \\
\text{MOV CX, } & \text{ 04}_H \\
\text{A5: MUL DL} \\
\text{LOOP A5}
\end{align*}
\]

(i) What is the content of register AX and CX (in Hexadecimal)?

(ii) What is the status of overflow flag, carry flag, auxiliary carry flag, sign flag and parity flag?

(b) Explain the differences between a near procedure call and a far procedure call in the microprocessor's point of view.

(c) Give ONLY one line alternative instruction that will perform the same outcome for each of the following instructions:

(i) \[\text{MOV BL, 02}_H \]
\[\text{MUL BL}\]

(ii) \[\text{MOV AL, } [0800]_H \]
\[\text{ADD AL, 01}_H \]
\[\text{MOV } [0800]_H, \text{ AL}\]

(iii) \[\text{XOR AL, AL}\]
Question 6

(a) Name and discuss THREE (3) types of hazards that can happen in a pipelined processor.

(10 marks)

(b) Suppose that AX=3024_H, BX=20CC_H, CX=8250_H and SP=0302_H.
Determine the value of SP and the values of the data in the registers concerned as we progress through the following instructions. By using diagram, show the content of the stack memory after each instruction being executed.

(15 marks)

```
PUSH CX
PUSH EX
PUSH AX
PUSH AX
POP AX
POP BX
POP CX
PUSH AX
POP BX
POP CX
```

<table>
<thead>
<tr>
<th>Stack Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS: 0300_H</td>
</tr>
<tr>
<td>SS: 0301_H</td>
</tr>
<tr>
<td>SS: 0302_H</td>
</tr>
<tr>
<td>SS: 0303_H</td>
</tr>
<tr>
<td>SS: 0304_H</td>
</tr>
</tbody>
</table>

START
SP = 0302_H

--- THE END ---

ICT2101/CSC2101(F)/Aug14