FINAL
Examination Paper
(COVER PAGE)

Session : April 2013
Programme : Diploma In Information And Communication Technology (DICTN/DICTI)
Course : ICT2101 / CSC2101: Computer Organisation
Date of Examination : July 30, 2013
Time : 2:00pm – 4:00pm 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.
Moderator : Ms. Deshinta Dewi

This paper consists of 4 printed pages, including the cover page.
INTI INTERNATIONAL COLLEGE SUBANG

DIPLOMA IN INFORMATION AND COMMUNICATIONS TECHNOLOGY PROGRAMME
(DICTN)
ICT2101/CSC 2101: COMPUTER ORGANISATION
FINAL EXAMINATION: APRIL 2013 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 stack pointer (SP) register of a 8086 microprocessor is currently pointing at memory address \(0\text{FFE}_{16}\) and the value of the code segment register (CS) and instruction pointer (IP) are \(3005_{16}\) and \(0010_{16}\) respectively. A near procedure call is then made,

i. Find the new value of SP

(3 marks)

ii. Depict the above situation in a diagram showing the memory location starting at address \(0\text{FFE}_{16}\) and ending at the address that you chose as the answer in Q1(a)i.

(6 marks)

(b) Given 100 8-bit unsigned numbers stored in data segment starting from address \(2000_{16}\), write an assembly program to find the smallest number and store it in register DL.

(16 marks)

QUESTION 2

(a) Trace register AX, carry flag (CF) and overflow flag (OF) for the following sequence of instructions. You are required to show results for each step in hexadecimal form. Use 'X' to represent undefined value.

(12 marks)

<table>
<thead>
<tr>
<th>Instruction</th>
<th>AX</th>
<th>CF</th>
<th>OF</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOV AX, FFFE&lt;sub&gt;16&lt;/sub&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADD AX, 04&lt;sub&gt;16&lt;/sub&gt;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MUL AL</td>
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<tr>
<td>SHL AX, 1</td>
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<td></td>
<td></td>
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<tr>
<td>CMP AH, AL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(b) The following is output from the `-r DEBUG` commands after a certain 8086 program has run with a breakpoint set.

```
AX=01FF BX=1000 CX=0050 DX=0000 SP=0215 BP=0000 SI=0000 DI=0000
DS=059A ES=12E4 SS=54B7 CS=7E35 IP=0102 NV UP EI PL NZ NA PO NC
3B4A:0102 58 POP AX
```

The answers of the following questions should be expressed in hexadecimal:

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

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

iii. The last address of the data segment in physical addressing scheme.  
     (3 marks)

(c) "Whereas human beings use base 10 (decimal) arithmetic, computers use the base 2 (binary) system". Answer the following questions with reference to the above statement:

i. Can computers be designed to operate on decimal system? Explain your answer.  
   (3 marks)

ii. Why are computers designed to operate on a binary system?  
    (3 marks)

**QUESTION 3**

(a) What is the maximum memory size supported by 8086 microprocessor? Prove you answer with appropriate calculations.  
   (3 marks)

(b) Show the 8-bit 2's complement binary representation of the following integers:
   
i. -33  
   (4 marks)

   ii. 44  
   (3 marks)

   iii. -155  
   (3 marks)

(c) By using an appropriate example, explain what is carry.  
   (4 marks)

(d) What are the differences between a near procedure call and a far procedure call from the microprocessor's point of view.  
   (8 marks)
QUESTION 4
(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. (9 marks)

(b) Modern CPUs have build-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) State the advantage and disadvantage of having
   i. a large register size, (4 marks)
   ii. a small register size, (4 marks)

QUESTION 5
(a) Identify and briefly explain any THREE (3) characteristics of RISC processor. (6 marks)

(b) Why memory protection is needed? How memory protection is implemented in memory paging system? (7 marks)

(c) Compare and contrast CPU polling, interrupt-driven I/O and direct memory access (DMA) in terms of processor involvement and efficiency. (12 marks)

QUESTION 6
(a) Give TWO (2) advantages and disadvantage of low-level programming. (8 marks)

(b) Briefly describe the function of each of the THREE (3) system bus. (6 marks)

(c) Add the following two 8-bit binary numbers in 2’s complement representation: 11011000₂ and 10110001₂. Does the sum cause an overflow? Shows the calculation and explain your answer. (7 marks)

(d) Briefly explain the concept of stored program computer (von Neumann Machine) architecture. (4 marks)

- The End -