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B.Sc./HD CIT 5th Semester 5 May, 2011 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
THE ORGANIZATION OF THE ISLAMIC CONFERENCE (OIC)
Department of Computer Science and Information Technology (CIT)

SEMESTER FINAL EXAMINATION **WINTER SEMESTER, 2010-2011**

DURATION: 3 Hours **FULL MARKS: 150**

CIT 4509: Microprocessors and Assembly Language

Programmable calculators are not allowed. Do not write anything on the question paper.
There are **8 (Eight)** questions. Answer any **6 (Six)** of them.
Figures in the right margin indicate marks.

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1. a) Draw the internal block diagram of an Intel 8086 microprocessor and briefly discuss the functionalities of pointer and index registers. 15
   b) Compute the segment number if the offset address is 321Bh and the memory location has a physical address A473Bh. 10

2. a) How can you define byte/word variables and named constants in assembly language? Give examples. 6
   b) Mention the restriction on MOV and XCHG instructions. How can we get around this restriction? 7
   c) Suppose ADD AX, BX is executed where AX contains E1E4h and BX contains 1ACBh. Predict the result and settings of CF, PF, ZF, SF and OF. 12

3. a) How does the microprocessor indicate that Overflow has occurred? 5
   b) Write some code to count the number of characters in an input line. 10
   c) Use a CASE structure to code the following: 10

   Read a character.
   If it's "a" then execute line feed.
   If it's "b" then execute carriage return.
   If it's any other character, then return to DOS.

4. a) With suitable examples, show how you can perform push and pop operation in stack. 8
   b) What will be the contents of stack and values of AX, BX, CX and SP after executing the following instructions? 10

```
MOV   AX,5678H
MOV   BX,1234H
MOV   CX,ABC9H
MOV   SP,100H
PUSH  BX
PUSH  AX
XCHG  AX,CX
POP   CX
PUSH  AX
POP   BX
```

   c) What is procedure? Explain how the IP and Stack are affected by procedure calls. 7

5. a) Write assembly language instruction to do the followings: 10
   i. Clear the odd-numbered bits of BX, leaving the other bits unchanged.
   ii. Divide the value of AX by 18 using SHIFT operation.
   iii. Complement the LSB of DX, leaving the other bits unchanged.
   iv. Set the MSB and LSB of BH, leaving the other bits unchanged.

   b) What is the function of TEST instruction? How does it work? How it is different from AND instruction? 7

   c) Write some code to count the number of 1 bits in BX, without changing BX. Put the answer in AX. 8

6. a) Explain how MUL and DIV instructions work. 8

   b) What is the purpose of DUP operator? Explain with example how DUPs may be nested? 7

   c) Write a procedure FACTORIAL that will compute 20! Suppose that overflow does not occur. 10

7. a) What do you understand by addressing modes? Discuss the following addressing modes for 8086 microprocessor. 10
   i. Direct mode
   ii. Register Indirect mode
   iii. Based Indexed mode

   b) Using based addressing mode write some code to sum in AX, the elements of the 5 element array X defined by 8

   ```
   X    DW    1,2,3,4,5
   ```

   c) Suppose that BETA is defined as 7

   ```
   BETA   DW   0123h, 0456h, 0789h, 0ABCDh
   ```

   in the segment adressed by DS. Suppose also that

   BX contains 4 — Offset 0004 contains 1048h
   SI contains 6 — Offset 0006 contains CBA2h
   DI contains 1

   Tell which of the following instructions are legal. If legal, give the source offset address and the number moved.

   i. MOV AX, [BETA+BX]
   ii. MOV BX, [BX+2]
   iii. MOV CX, BETA[SI]
   iv. MOV AX -2[SI]
   v. MOV BX, [BETA+1+DI]
   vi. MOV AX, [BX]2
   vii. ADD BX, [BETA+AX]

8. a) Write a sequence of instructions to do the following: 10
   Put the sum $95 + 90 + 85 + \ldots + 5$ in AX.

   b) Suppose AL contains 7Ch, CF = 0 and CL contains 4. What are the values of AL and CF after the following instruction is executed. 10

   ```
   RCR  AL, CL
   ```

   c) What is the maximum range of a conditional jump? Which instruction can be used to get around the range restriction of a conditional jump? Describe with example. 5