



Name:
Number:

Date: 27 April 2009

EENG410/INFE410 - MICROPROCESSORS I Midterm Exam

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Instructor: Dr. Hasan Demirel

Read the Following Instructions Carefully:

1. The duration of the exam is strictly **100** minutes. No extra time will be given.
2. Answer each question to a separate sheet on your answers booklet.
3. Return the question sheet along with your answers booklet.

QUESTIONS

1. (**%18**) What will be the values of the specified registers and flags after the execution of the following instructions?

a) MOV DX, 896AH
MOV CX, 9CABH
ADD DH, CL
ADC CX, DX

b) MOV AX, 29FEH
MOV CX, 8C03H
SHL AH, CL
SBB AX, CX

DX=?, CX=?,
CF=?, PF=?, AF=?, SF=?, ZF=?

AX=?, CX=?,
CF=?, PF=?, AF=?, SF=?, ZF=?

- c) (**%7**) Write a sequence of instructions that counts number of 1s in registers AX and BX. Then, the content of the register with the higher number of 1s is copied into register DX.

2. (**%25**) Write the definition of a subroutine which would **Capitalize Each Word** in a given sentence in the following data segment. Note that, in a capitalized word, only the first letter is uppercase and rest of the letters is lowercase.

```
.DATA
INSTR      DB    'CYPRUS is the largest island in the mediterranean'
OUTSTR     DB    49 DUP(?)
```

Hint: Lowercase characters are ordered between 'a' (61H) and 'z' (7AH) in the in the ASCII Code table. For lowercase letters, bit 5 (d5) of the ASCII code is 1 where for uppercase letters it is 0. For example,

Letter	Binary	ASCII
'h'	01101000	68H
'H'	01001000	48H

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3. (%25) Assume that two doubleword unsigned numbers, X and Y, are defined in the data segment. Write a subroutine to add these two doubleword unsigned numbers ($Z=X+Y$). Due to overflow possibility the result may be a quadword. The subroutine should be general and work for all possible unsigned doubleword addition. You may consider the following data segment as an example.

```
.DATA
X      DD      4B1023A6H          ; X is given in decimal form
Y      DD      C147C023H          ; Y is given in decimal form
Z      DQ      ?                  ; Z=X+Y
```

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4. (%25) Write an assembly language program, which
- inputs/enters your student number through the keyboard into a buffer,
 - converts the input ASCII number into a BCD number and saves the BCD number into another variable in the data segment.
 - Finally, the student number entered by the user is displayed at the center of the monitor.

Important Interrupts Routines:

INT 21H AH=0AH inputs a string of data from the keyboard. Assumes the offset address of the buffer in DX.

INT 21H AH=02H outputs a character to the monitor. Assumes the character in DL (ASCII)

INT 10H AH=02H sets the cursor position. Assumes the row in DH and column in DL.
