

Maynooth International Engineering College

CS253FZ Computer Architecture 2

Class Test

Q1. Study the x86 assembly language block of code below and answer the following questions.

```

                mov bx,0           ;clear bx for digits storage
                                ;<<HERE1
next:           mov ah,08h
                int 021h           ;read in key pressed
                cmp al,13
                je done            ;finish if <ret> pressed
                cmp al,030h
                jb next            ;jmp if below
                cmp al,039h
                jnb next           ;jmp if not below

                mov dl,a1
                mov ah,02h
                int 021h           ;echo key pressed

                mov cx, 4
hinib:          shl bx,1
                loop hinib         ;shift number to higher nibble
                and ax,0fh         ;change ASCII to number
                or bx,ax           ;store digit
                                ;<<HERE2
                jmp next           ;<<THERE
```

This block of code takes in characters typed on the keyboard, echo some of these characters and store digit values into the register bx.

- If the string of characters typed into the PC is 1a2b3c4d followed by the return key, <ret>, what will be echoed on the screen of the PC?
 - What will be the 4-digit hexadecimal value stored in the register bx?
 - If the string typed in is 987xyz654 followed by <ret>, what will be echoed on the screen?
 - What will be the 4-digit hexadecimal value stored in the register bx?
 - If the string typed in is pqrst2vw34xyz followed by <ret>, what will be echoed on the screen?
 - What will be the 4-digit hexadecimal value stored in the register bx?
- (5 marks each)
- Add one instruction at each of the two locations marked <<HERE1 and <<HERE2 and modify the instruction marked <<THERE so that the code will accept at most 4 digits, meaning that the program will exit this block of code once 4 digits are typed. Use the register di to keep track of number of digits typed.

(10 marks)

Q2. After the code in Q1 above is executed, the number typed in will be stored in the register bx. You have to write another block of code following the suggestions given below in the space provided in the answer script. The code will output the contents of bx to the screen.

label	Assembly code	marks
	.DATA	
count4	byte 4 ;used for counting number of nibbles in bx	
print:	Use cx to count 4 bits in each nibble Clear ax and carry for shifting nibbles	(10 marks)
again:	Move from high nibble from bx to low nibble of ax	(10 marks)
	Convert bcd number to ASCII	(10 marks)
	Output to screen Do it for all 4 nibbles in bx	(10 marks)

Q3. The number stored by the code in Q1 is in BCD format. Write out the following decimal numbers in BCD (show the bits), hex, octal and binary formats. For example, the number 10 decimal is 1 0000 in BCD, A in hex, 12 in octal and 1010 in binary.

- a) 4,567 (10 marks)
- b) 8,899 (10 marks)

[Total: 100 marks]