Computer Organization and Assembly Language

Final Exam, Spring 2014

Date: 26-05-2014 **Marks: 50** **Time: 180 mins.**

- It is an open book and open notes exam. Write neat and well-commented programs.
- **You are not allowed to ask anything during exam. In case you find any ambiguity in a question, clearly state your assumptions and move on.**

Question 1: [12 Marks]

Suppose that data (of a screen saver) of 2000 words of display memory is placed on stack with the last word of display memory (i.e. word at 0xB800:3998) placed at the bottom of the stack. You need to display this data on screen and after each second slide it by *n* characters towards left starting from the bottom of the screen. Initially the value of n is 2 (i.e. you need to slide each character towards its left by *n* units), after another second passes by, this value will be 4 (previous value of n*2), after yet another second it will be 8 (previous value of n *2). This will continue till the whole screen data will be rubbed off. Use white foreground to rub data.

Use *string instructions only* to dump and slide data on display screen. No credit will be given without string instructions. Note that you are not required to scroll up rows here neither you are required to slide all rows simultaneously towards their left. You are required to slide characters towards left starting from bottom right corner of screen sliding (snaking) its way up to top left corner.

Let's say initially data dumped on screen is like this. Note the bold alphabets to understand how sliding is going on.

Initial Data:	After 2 sec:	After 4 sec:
This is a sample mini window. It **wi**ll show how to left slide (shift) **ea**ch character of screen starting **fr**om bottom right corner shifting **al**l the way up towards top left **co**rner. **Ho**pe I have made myself clear.Go	is is a sample mini window. It **wi** ll show how to left slide (shift) **ea** ch character of screen starting **fr** om bottom right corner shifting **al** l the way up towards top left **co** rner. **Ho** pe I have made myself clear.Go	s a sample mini window. It wi**ll s** how how to left slide (shift) ea**ch c** haracter of screen starting fr**om** b ottom right corner shifting al**l th** e way up towards top left co**rner** . Ho**pe I** have made myself clear.Go

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Question 2: [12 Marks]

BIOS has its keyboard services hooked at int 0x16. Update its "get character" service (ah=0) such that whenever an alphabet's key (a-z, A-Z) is pressed on keyboard, this service returns the ascii of the respective lower case letter (a-z) in al. For every other keystroke, 0x16 behavior remains unchanged. *Take reasonable assumptions where needed and state them clearly.*

Question 3: [12 Marks]

Consider a multi-tasking kernel running *n* parallel threads of *3* given tasks. The kernel is hooked on interrupt 0x80 (just as the example given in book). Apart from creating new tasks, now our multi-tasking kernel is also capable of "suspending" and "resuming" tasks. When key 1 is pressed all threads of task1 should be suspended. These all threads can be resumed when key 1 is pressed again. Similarly, key 2 and key 3 will be suspending and resuming threads of task 2 and task 3 respectively.

Implement these changes in the multitasking kernel and driver program as a code snippet (don't copy the kernel code).

Question 4: [7*2 Marks]

Answer the following questions.

(i) Which registers the following instruction changes?

call label1

(ii) At 0x3000 : 0x035D (CS: IP) a jump instruction is placed as follows:
0x3000 : 0x035D 75 EB
What will be the *physcial address* this jump will take us to?

(iii) At 0x2000 : 0x034F (CS: IP) a jump instruction is placed with displacemet unknown.
0x2000 : 0x034F EB XXXX
What is the range of *physcial addresses* this offset can reach?

(iv) If paragraph size is 32 bytes what factor should be added to calculate the exact number of paragraphs till start label? Factor Value: _____

(v) At which address we will write ASCII of 'A' if we want to display it at row 5 column 15? 0xB800 + _____ bytes

(vi) What will be the value in al and ah (in hexadecimal) after the following instructions?

```
mov ah, 0
mov al, 142
shl ax, 2
```

(vii) What will be the value in ax (in hexadecimal) after the following instructions?

```
mov ax, 0x44
mov bx, 0x13
push ax
push bx
add sp, 2
pop ax
```

☠ GOOD LUCK ☠