National University of Computer and Emerging Sciences



**Laboratory Manual**

*for*

**Computer Organization and Assembly Language Programming**

**(EL 213)**

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**Objectives**

After performing this lab, students shall be able to:

* Hook hardware interrupts
* Write a TSR
* Get the data from RTC

**Exercise 1:** An interval is a slice of time. There shall be multiple intervals in this program. Let's say an interval starts when a user hits ENTER and the interval ends when ESC key is pressed. Write an ISR to track the typing of the user within an interval. During each interval a user can press multiple keys. You have to print an asterisk on screen every time a key is pressed in an interval. If no interval is in progress and the user presses F10, Your ISR should end.

* For every interval, print asterisks vertically on right most column. Clear the column once an interval ends
* When no interval is in progress, no keystroke, except F10 should cause any difference.

**Exercise 2:** Write an ISR that shows clock on upper right corner of screen in the format HH:MM:SS; where HH is hours in 24 hour format, MM is minutes, SS is seconds. The clock should appear when a key is pressed and vanish as soon as the key is released.

HINT: IBM PC uses a Real Time Clock (RTC) chip to keep track of time while switched off. It provides clock and calendar functions through its two I/O ports 70h and 71h. It is used as follows:

mov al, <command>

out 0x70, al ; command byte written at first port

jmp D1 ; waste one instruction time

D1: in al, 0x71 ; result of command is in AL now

Following are few commands to put in al

00 Get current second

02 Get current minute

04 Get current hour

All numbers returned by RTC are in BCD. E.g. if it is 6:30 the second and third command will return 0x30 and 0x06 respectively in al.

**Exercise 3:** Modify above code so that it is now a TSR that shows a clock in the upper right corner of the screen all the time.