MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
COURSE TITLE: MICROPROCESSOR AND MICROCONTROLLER SESSIONAL
COURSE CODE: CSE 306
LAB MANUAL 5

Table: MDA-8086 I/O Address Map for Keyboard

Address	I/O Port Functions	Device
01H	KEYBOARD REGISTER	Keyboard
03H	KEYBOARD FLAG	

Keyboard:

The keyboard consists of 16 of hexadecimal keys and 8 function keys.

Position code:

Key	0	1	2	3	4	5	6	7
Code	00	01	02	03	04	05	06	07
Key	8	9	A	B	C	D	E	F
Code	08	09	0A	0B	0C	0D	0E	0F
Key	:	STP	GO	REG	-	+	DA	AD
Code	10	11	12	13	14	15	16	17

Key input algorithm:

Read flag status in AL
Check flag bit
If ready, take data from keyboard in AL
Remove garbage value from the first 3 bit
Move AL to DL
For 2 times do
    Rotate DL right 4 times
    Mov DL to AH
    And AH with 0FH
    If AH<10
        Convert it to character in '0…9'
    Else
        Convert it to character in 'A…F'
    End_if
    Output character
End_for

Experiment:

```
      CODE  SEGMENT
      ASSUME     CS:CODE,DS:CODE,ES:CODE,SS:CODE


      KEY   EQU 01H ; USED TO TAKE INPU FROM KEYBOARD
      KEY_F EQU 03H ; USED TO READ STATUS FROM KEYBOARD
      IR_WR EQU 00H ; USED TO WRITE INSTRUCTION REGISTER OF LCD DISPLAY
      ST_RD EQU 02H ; USED TO READ STATUS OF LCD DISPLAY
      DR_WR EQU 04H ; USED TO WRITE DISPLAY DATA RAM OF LCD DISPLAY

      ORG   1000H

      CALL  ALLCLR           ;TO CLEAR DISPLAY
      CALL CURSOR_HOME
      MOV   SI,OFFSET DATA
      CALL  STRING           ;TO OUTPUT THE FIRST LINE IN THE LCD
L1:   CALL  LN2C             ;TO TAKE THE CURSOR IN SECOND LINE
      CALL  SCAN             ;TAKE INPUT FROM KEYBOARD
      MOV   DL,AL
      CALL DECIMAL
      JMP   L1

      DATA  DB 'KEY CODE',00H

ALLCLR:MOV AH,01H
       JMP  OUT
CURSORHOME:
      MOV AH,02H
      JMP OUT
LN2C: MOV  AH,0C0H

OUT:  CALL  BUSY
      MOV   AL,AH
      OUT   IR_WR,AL
      RET

BUSY: IN    AL,ST_RD
      TEST  AL,10000000B ; BUSY FLAG CHECK
      JNZ   BUSY
      RET

CHAROUT:                ; 1 CHAR. LCD OUT , AH = OUT DATA
      CALL  BUSY
      MOV   AL,AH
      OUT   DR_WR,AL
      RET
```

```
STRING:
      MOV   AH,CS:[SI]
      CMP   AH,00H
      JE    STRING1
      CALL  BUSY
      CALL  CHAROUT
      INC   SI
      JMP   STRING
STRING1:
      RET

SCAN:                              ; KEY BOARD SCAN
      IN    AL,KEY_F
      TEST  AL,10000000B           ; CHECKING BUSY FLAG
      JNZ   SCAN
      IN AL,KEY
      AND   AL,00011111B           ; TO ERASE GARBAGE VALUE
      OUT   KEY,AL
      RET

DECIMAL:
      MOV BL,2
      MOV CL,4
AGAIN:
      ROR DL,CL
      MOV AH,DL
      AND AH, 00001111B
      CMP AH,9
      JG LETTER
      ADD AH,48
      JMP PRINT
LETTER:
     ADD AH,55
PRINT:
      CALL CHAROUT
      DEC BL
      CMP BL,0
      JE EXIT
      JMP AGAIN
EXIT: RET
CODE  ENDS
      END
```