```asm
1    ORG 000H
2
3    RS EQU P1.4
4    RW EQU P1.5
5    E  EQU P1.6
6    SIGNAL_PIN EQU P3.6
7    MESSAGE_ADDRESS EQU 250H
8    TIMER_VALUES_START_ADDRESS EQU 1FEH
9
10   CLR SIGNAL_PIN
11
12   ACALL LCD_INIT
13   START:
14   ;******************* WRITING MESSAGE ******************
15   MOV R6,#16 ;COUNTER
16   MOV DPTR,#MESSAGE_ADDRESS
17   PRINT:CLR A
18   MOVC A,@A+DPTR
19   ACALL LCD_DATA
20   INC DPTR
21   DJNZ R6,PRINT
22
23   ;******************* TAKING INPUT FROM USER ******************
24   ACALL KEYPAD
25   MOV B,A
26   CJNE A,#'0',DISPLAY_FREQUENCY
27   SJMP INVALID
28
29   ;******************* DISPLAYING FREQUENCY ON LCD ******************
30   DISPLAY_FREQUENCY:
31   MOV B,A
32   ACALL LCD_CLEAR
33   MOV A,B
34   ACALL LCD_DATA
35   MOV A,#'k'
36   ACALL LCD_DATA
37   MOV A,#'H'
38   ACALL LCD_DATA
39   MOV A,#'Z'
40   ACALL LCD_DATA
41   MOV A,B
42
43   ANL A,#0FH
44   CJNE A,#1,TIMER_MODE_2
45
46
47   MOV TMOD,#10H                ;INITIALIZING TIMER1 ON MODE 1
48   FREQUENCY_1_KHZ:
49   MOV TL1,#34H
50   MOV TH1,#0FEH
51   SETB TR1                     ;START TIMER
52   HERE_1_KHZ:JNB TF1,HERE_1_KHZ;wait till timer ends
53   CLR TR1                      ;STOP TIMER
54   CLR TF1                      ;CLEAR THE FLAG
55   CPL SIGNAL_PIN               ;TOGGLING SIGNAL PIN TO GENERATE CLOCK SIGNAL
56   SJMP FREQUENCY_1_KHZ
57
58
59   TIMER_MODE_2:
60   MOV TMOD,#20H                ;INITIALIZING TIMER1 ON MODE 2
61   MOV DPTR,#TIMER_VALUES_START_ADDRESS
62   MOVC A,@A+DPTR               ;LOADING THE INITIAL VALUE OF TIMER FROM MEMORY
63
64   MOV TH1,A
65   AGAIN_ACC:
66   SETB TR1                     ;START TIMER1
67   HERE_ACC: JNB TF1,HERE_ACC   ;wait till timer ends
68   CLR TF1                      ;CLEAR TIMER FLAG
69   CLR TR1                      ;STOP TIMER1
70   CPL SIGNAL_PIN               ;TOGGLING SIGNAL PIN TO GENERATE CLOCK SIGNAL
71   SJMP AGAIN_ACC
72
73
74   ;******************* INVALID ROUTINE ******************
75   INVALID:
76   ACALL LCD_CLEAR
77   MOV DPTR,#270H
```

```asm
 78     MOV R6,#14 ;COUNTER
 79     PRINT_INVALID:CLR A
 80     MOVC A,@A+DPTR
 81     ACALL LCD_DATA
 82     INC DPTR
 83     DJNZ R6,PRINT_INVALID
 84     ACALL MESSAGE_DELAY
 85     ACALL LCD_CLEAR
 86     SJMP START
 87
 88
 89     ;******************** Initialization of LCD *****************
 90     LCD_INIT:
 91     MOV A,#02H   ;Return Home
 92     ACALL LCD_COMMAND
 93
 94     MOV A,#28H   ;4-Bit Mode, 2 Lines
 95     ACALL LCD_COMMAND
 96
 97     MOV A,#0CH   ;Display on , Cursor off , Cursor blink off
 98     ACALL LCD_COMMAND
 99
100     MOV A,#06H   ;Increment Cursor after every write operation
101     ACALL LCD_COMMAND
102
103     MOV A,#01H   ;Clear the LCD
104     ACALL LCD_COMMAND
105     RET
106
107
108     ;******************** FUNCTION OF LCD COMMAND ******************
109     LCD_COMMAND:
110     MOV R7,A
111     CLR RS
112     CLR E
113     CLR RW
114
115     ANL P2,#0FH
116     ANL A,#0F0H
117     ORL P2,A
118     SETB E
119     ACALL DELAY
120     CLR E
121     ACALL DELAY
122
123     MOV A,R7
124     SWAP A
125     ANL P2,#0FH
126     ANL A,#0F0H
127     ORL P2,A
128     SETB E
129     ACALL DELAY
130     CLR E
131     ACALL DELAY
132     RET
133
134
135     ;******************** FUNCTION OF LCD DATA *****************
136     LCD_DATA:
137     MOV R7,A
138     SETB RS
139     CLR E
140     CLR RW
141
142     ANL P2,#0FH
143     ANL A,#0F0H
144     ORL P2,A
145     SETB E
146     ACALL DELAY
147     CLR E
148     ACALL DELAY
149
150     MOV A,R7
151     SWAP A
152     ANL P2,#0FH
153     ANL A,#0F0H
154     ORL P2,A
```

```asm
155    SETB E
156    ACALL DELAY
157    CLR E
158    ACALL DELAY
159
160    RET
161
162
163    ;****************** FUNCTION OF KEYPAD ******************
164    KEYPAD:
165    ORL P2,#0FH
166    ANL P1,#0F0H
167    NEXT:
168    CLR A
169    MOV A,P2
170    ANL A,#0FH
171    CJNE A,#00001111B,NEXT
172    AGAIN:
173    MOV A,P2
174    ANL A,#0FH
175    CJNE A,#0FH,OVER
176    SJMP AGAIN
177    OVER:
178    ACALL DDELAY
179    MOV A,P2
180    ANL A,#0FH
181    CJNE A,#0FH,OVER2
182    SJMP AGAIN
183    OVER2:
184    ANL P1,#11111110B
185    ORL P1,#00001110B
186    MOV A,P2
187    ANL A,#0FH
188    CJNE A,#0FH,ROW0
189    ANL P1,#11111101B
190    ORL P1,#00001101B
191    MOV A,P2
192    ANL A,#0FH
193    CJNE A,#0FH,ROW1
194    ANL P1,#11111011B
195    ORL P1,#00001011B
196    MOV A,P2
197    ANL A,#0FH
198    CJNE A,#0FH,ROW2
199    ANL P1,#11110111B
200    ORL P1,#00000111B
201    MOV A,P2
202    ANL A,#0FH
203    CJNE A,#0FH,ROW3
204    SJMP AGAIN
205    ROW0:
206    MOV DPTR,#KROW0
207    SJMP FINAL
208    ROW1:
209    MOV DPTR,#KROW1
210    SJMP FINAL
211    ROW2:
212    MOV DPTR,#KROW2
213    SJMP FINAL
214    ROW3:
215    MOV DPTR,#KROW3
216    SJMP FINAL
217    FINAL:
218    RRC A
219    JNC MATCH
220    INC DPTR
221    SJMP FINAL
222    MATCH:
223    CLR A
224    MOVC A,@ A+DPTR
225    RET
226
227
228    ;****************** DELAY OF LCD ******************
229    DELAY:
230    MOV R3,#50
231    LOOP2: MOV R2,#255
```

```asm
232    LOOP1: DJNZ R2,LOOP1
233    DJNZ R3,LOOP2
234    RET
235
236    ;******************* DELAY OF KEYPAD ******************
237    DDELAY:
238    MOV R5,#36
239    LOP2: MOV R4,#255
240    LOP1: DJNZ R4,LOP1
241    DJNZ R5,LOP2
242    RET
243
244    ;******************* DELAY OF MESSAGE ******************
245    MESSAGE_DELAY:
246    MOV R0,#30
247    DELAY_AGAIN:ACALL DELAY
248    DJNZ R0,DELAY_AGAIN
249    RET
250
251    ;******************* CLEAR OF LCD ******************
252    LCD_CLEAR:
253    MOV A,#01H
254    LCALL lCD_COMMAND
255    RET
256
257
258    ;******************* DATA SECTION ******************
259    ORG 200H
260        DB 1AH, 67H, 8DH, 0A4H, 0B4H, 0BFH, 0C7H, 0CDH
261
262    ORG 220H
263        KROW0: DB '7','8','9','0'
264        KROW1: DB '4','5','6','0'
265        KROW2: DB '1','2','3','0'
266        KROW3: DB '0','0','0','0'
267
268    ORG 250H
269        FIRST_MESSAGE: DB 'c','h','o','o','s','e',' ','f','r','e','q','u','e','n','c','y'
270
271    ORG 270H
272        INVALID_MESSAGE: DB 'I','n','v','a','l','i','d',' ','i','n','p','u','t','!'
273    END
```