|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **9. DISPLAY MESSAGES FIRE AND HELP ALTERNATELY WITH FLICKERING EFFECTS ON A 7-SEGMENT DISPLAY INTERFACE FOR A SUITABLE PERIOD OF TIME. ENSURE A FLASHING RATE THAT MAKES IT EASY TO READ BOTH THE MESSAGES (EXAMINER DOES NOT SPECIFY THESE DELAY VALUES NOR IS IT NECESSARY FOR THE STUDENT TO COMPUTE THESE VALUES).** | | | | | | |
| **LABEL** | **NEMONIC** | **OPERAND (MEMORY/REGISTER)** | | |  | **COMMENTS** |
|  | **.MODEL** | **SMALL** | | | **;** |  |
|  | **.DATA** |  | | | **;** |  |
| **PA** | **EQU** | **0XXXXH** | | | **;** | **ADDRESS OF PORT A** |
| **PB** | **EQU** | **0XXXXH** | | | **;** | **ADDRESS OF PORT B** |
| **PC** | **EQU** | **0XXXXH** | | | **;** | **ADDRESS OF PORT C** |
| **CTRL** | **EQU** | **0XXXXH** | | | **;** | **ADDRESS OF CONTROL WORD** |
| **FIRE** | **DB** | **79H,77H,06H,71H** | | | **;** | **DISPLAY STRING IN 7-SEG HEX CODE** |
| **HELP** | **DB** | **73H,38H,79H,76H** | | | **;** | **DISPLAY STRING IN 7-SEG HEX CODE** |
|  | **.CODE** |  | | | **;** |  |
|  | **MOV** | **AX** | **,** | **@DATA** | **;** | **INITIALIZATION OF DATA SEGMENT** |
|  | **MOV** | **DS** | **,** | **AX** | **;** |  |
|  |  |  |  |  |  |  |
|  | **MOV** | **AL** | **,** | **80H** | **;** | **INITIALIZATION OF 8255 CONTROL WORD** |
|  | **MOV** | **DX** | **,** | **CTRL** | **;** |  |
|  | **OUT** | **DX** | **,** | **AL** | **;** |  |
|  |  |  |  |  |  |  |
|  | **MOV** | **CX** | **,** | **10** | **;** | **SET NUMBER OF FLASHS** |
| **NXTROUND:** | **PUSH** | **CX** |  |  | **;** |  |
|  |  |  |  |  |  |  |
|  | **MOV** | **CX** | **,** | **0FFH** | **;** | **SET NUMBER OF REFRESH RATE** |
| **NXTCYCLE1:** | **PUSH** | **CX** |  |  | **;** |  |
|  |  |  |  |  |  |  |
|  | **LEA** | **SI** | **,** | **HELP** | **;** | **POINT SI TO HELP STRING** |
|  | **MOV** | **CX** | **,** | **04** | **;** | **SET NUMBER OF DIGITS TO DISPLAY** |
|  | **MOV** | **AL** | **,** | **00H** | **;** | **TO SELECT D0 DISPLAY UNIT ON INTERFACE** |
|  |  |  |  |  |  |  |
| **NXTDIGIT1:** | **MOV** | **DX** | **,** | **PC** | **;** | **SELECT A DISPLAY UNIT ON INTERFACE** |
|  | **OUT** | **DX** | **,** | **AL** | **;** |  |
|  | **PUSH** | **AX** |  |  | **;** |  |
|  | **MOV** | **AL** | **,** | **[ SI ]** | **;** | **DISPLAY DIGIT OF SELECTED DISPLAY UNIT** |
|  | **MOV** | **DX** | **,** | **PA** | **;** |  |
|  | **OUT** | **DX** | **,** | **AL** | **;** |  |
|  | **POP** | **AX** |  |  | **;** |  |
|  | **INC** | **AL** |  |  | **;** | **UPDATE TO SELECT NEXT DISPLAY UNIT** |
|  | **INC** | **SI** |  |  | **;** | **UPDATE TO SELECT NEXT CODE IN THE HELP** |
|  | **CALL** | **DELAY** |  |  | **;** | **RETAIN THE DISPLAY FOR SOME TIME(MSEC)** |
|  | **LOOP** | **NXTDIGIT1** |  |  | **;** | **GOTO NEXT DIGIT CODE** |
|  |  |  |  |  |  |  |
|  | **POP** | **CX** |  |  | **;** |  |
|  | **LOOP** | **NXTCYCLE1** |  |  | **;** | **GOTO NEXT REFRESH CYCLE** |
|  |  |  |  |  | **;** |  |
|  | **MOV** | **CX** | **,** | **0FFH** | **;** | **SET NUMBER OF REFRESH RATE** |
| **NXTCYCLE2:** | **PUSH** | **CX** |  |  | **;** |  |
|  |  |  |  |  |  |  |
|  | **LEA** | **SI** | **,** | **FIRE** | **;** | **POINT SI TO FIRE STRING** |
|  | **MOV** | **CX** | **,** | **04** | **;** | **SET NUMBER OF DIGITS TO DISPLAY** |
|  | **MOV** | **AL** | **,** | **00H** | **;** | **TO SELECT D0 DISPLAY UNIT ON INTERFACE** |
|  |  |  |  |  |  |  |
| **NXTDIGIT2:** | **MOV** | **DX** | **,** | **PC** | **;** | **SELECT A DISPLAY UNIT ON INTERFACE** |
|  | **OUT** | **DX** | **,** | **AL** | **;** |  |
|  | **PUSH** | **AX** |  |  | **;** |  |
|  | **MOV** | **AL** | **,** | **[ SI ]** | **;** | **DISPLAY DIGIT ON SELECTED DISPLAY UNIT** |
|  | **MOV** | **DX** | **,** | **PA** | **;** |  |
|  | **OUT** | **DX** | **,** | **AL** | **;** |  |
|  | **POP** | **AX** |  |  | **;** |  |
|  | **INC** | **AL** |  |  | **;** | **UPDATE TO SELECT NEXT DISPLAY UNIT** |
|  | **INC** | **SI** |  |  | **;** | **UPDATE TO SELECT NEXT CODE IN THE FIRE** |
|  | **CALL** | **DELAY** |  |  | **;** | **RETAIN THE DISPLAY FOR SOME TIME(MSECS)** |
|  | **LOOP** | **NXTDIGIT2** |  |  | **;** | **GOTO NEXT DIGIT CODE** |
|  |  |  |  |  |  |  |
|  | **POP** | **CX** |  |  | **;** |  |
|  | **LOOP** | **NXTCYCLE2** |  |  | **;** | **GOTO NEXT REFRESH CYCLE** |
|  |  |  |  |  |  |  |
|  | **POP** | **CX** |  |  | **;** |  |
|  | **LOOP** | **NXTROUND** |  |  | **;** | **GOTO NEXT FLASH EFFECT** |
|  |  |  |  |  |  |  |
|  | **INT 3** |  |  |  | **;** |  |
|  |  |  |  |  |  |  |
| **DELAY** | **PROC** |  |  |  | **;** | **DELAY PROCEDURE TO ELAPSE TIME** |
|  | **PUSH** | **CX** |  |  |  | **SAVE THE CONTENTS OF CX** |
|  |  |  |  |  |  |  |
|  | **MOV** | **CX** | **,** | **0FH** | **;** | **SET OUTER LOOP COUNT** |
| **OUTER:** | **PUSH** | **CX** |  |  | **;** |  |
|  |  |  |  |  | **;** |  |
|  | **MOV** | **CX** |  | **0FFFFH** |  | **SET INNER LOOP COUNT** |
| **INNER:** | **NOP** |  |  |  | **;** | **NO OPERATION INSTRUCTIONS** |
|  | **NOP** |  |  |  | **;** |  |
|  | **NOP** |  |  |  | **;** |  |
|  | **LOOP** | **INNER** |  |  | **;** | **GOTO INNER** |
|  |  |  |  |  |  |  |
|  | **POP** | **CX** |  |  | **;** |  |
|  | **LOOP** | **OUTER** |  |  | **;** | **GOTO OUTER** |
|  |  |  |  |  |  |  |
|  | **POP** | **CX** |  |  |  | **RESTORE THE CONTENTS OF CX** |
|  |  |  |  |  |  |  |
|  | **RET** |  |  |  | **;** | **RETUREN TO CALLING PROCEDURE** |
| **DELAY** | **ENDP** |  |  |  | **;** | **END OF PROCEDURE** |
|  |  |  |  |  |  |  |
|  | **END** |  |  |  | **;** | **END OF PROGRAM** |

**OUTPUT**

* **Edit filename.asm**
* **Masm filename.asm;**
* **Link filename;**
* **allowio 0x1080H**
* **Debug filename.exe**

**-g**

**On Seven Segment Display**

**FIRE**

**HELP**

**FIRE**

**HELP**

**FIRE**

**HELP**

**FIRE**

**HELP**

**FIRE**

**HELP**

**Write output as displayed in segments .**