Military Institute of Science & Technology

Dept. of Computer Science & Engineering

Computer Interfacing

CSE - 405

Term Paper

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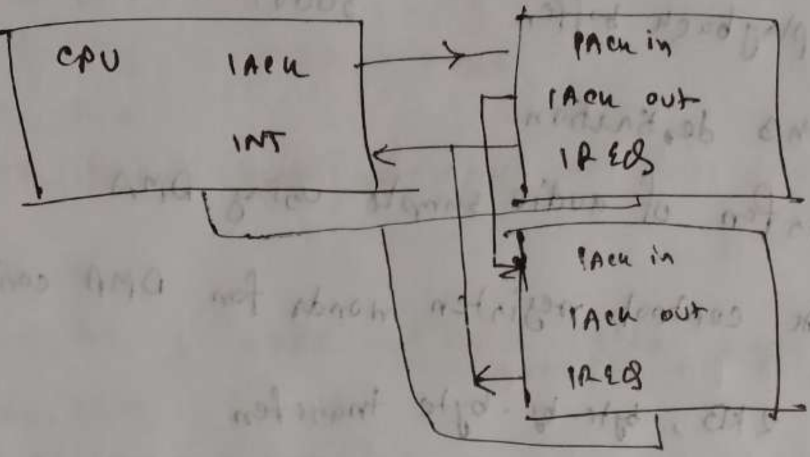
Topics

i) Daisy chain Interrupt handling

ii) DMA controller Coding

iii) i) Stepper Motor
  ii) Assembly code for stepper motor

1) Daisy chain Internupt handling



5 Internupts INT1 > INT2 > INT3 > INT4 > INT5 in a daisy chain priority scheme. If INT3 in nunning & INT1 becomes active, 2 possible cases.

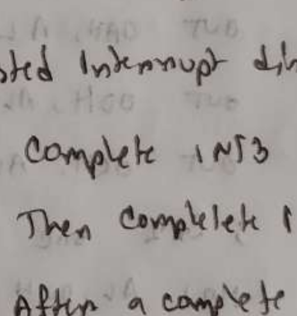
Daisy Chain Internupt

Nested Internupt Enabled

- IAck for INT1
- Suspend ISR for INT3
- Save INT3 credentials in Stack
- Provide service for INT1
- Pop INT3 aften service providing & provide INT3.

Nested Internupt disabled

- Complete INT3 service.
- Then Completek INT4, INT5
- After a complete cycle, then resume to INT1.



11) Audio sample stored in memory 4000H - 47FFH

Sound card's playback buffer 5000H - 57FFH

Ch2 src, Ch3 destination

Automate transfer of audio sample using DMA.

Need to write control register words for DMA controller

Transfer size 2KB, byte-by-byte transfer

```
DMA_BASE EQU 00H ; Base I/O port for DMA

START :
      MOV AL,0FFH
      OUT  0AH, AL ; disable all channels
      OUT  0DH, AL ; Reset controller
      OUT  0CH, AL ; clear flip flop
      ; Ch2 src 4000H-47FFH.
      MOV AL,00H
      OUT  04H, AL ; Lower byte 4000H
      MOV AL, 40H
      OUT  04H, AL ; high byte 4000 H

      MOV  AL, 00H
      OUT  05H, AL ; Lower byte of (2048-1 = 07FFH)
      MOV  AL, 08H
      OUT  05H, AL ; high byte
```

```
; Ch3 setup   5000H - 57FFH

 MOV AL, 00H
 OUT 06H, AL    ; 5000 → 5000
 MOV AL, 50H
 OUT 06H, AL    ; 5000 → 5000

  MOV AL, 00H
  OUT 07H, AL  ;  07FF → [0800 - 1] → ~~8000~~ 0800
  MOV AL, 08H
  OUT 07H, AL ; 0800

; set mode registers
; Ch2 ; memory read 01, single transfer 01
; ch 3 ; memory write 10, single transfer 01

MOV AL, 4AH   ; ch2  single trx, rd
OUT 0BH, AL
MOV AL, 53H   ; ch 3  single trx, ~~wr~~ write
OUT 0BH, AL

; UNMASK channels

 MOV AL, 0FBH  ; ch2 enable
 OUT 0AH, AL
 MOV AL, 0F7H  ; ch 3 enable
 OUT 0AH, AL

 HLT

END START
```

3) i)

npn danlington pain is used for cunnent amplification

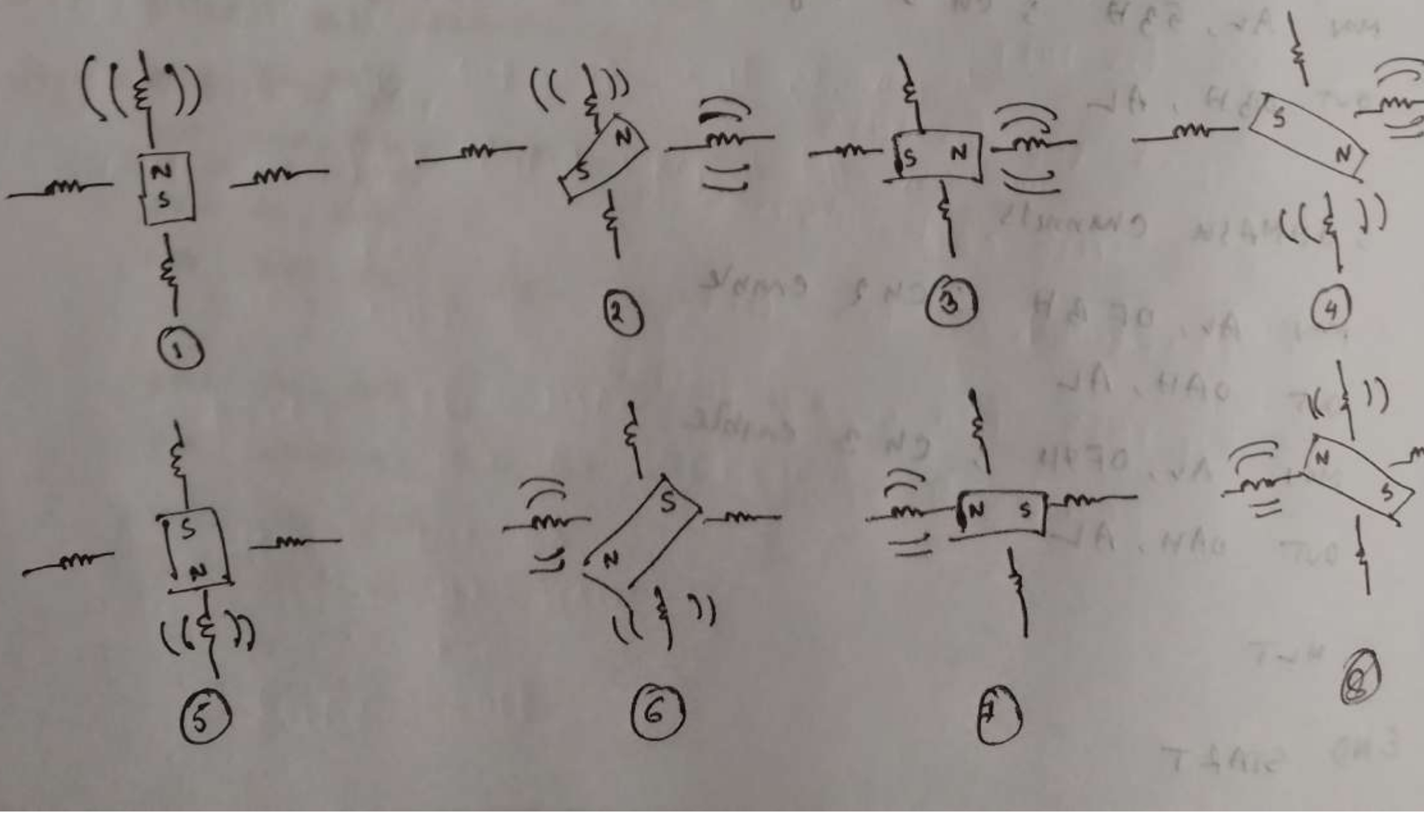
half step:

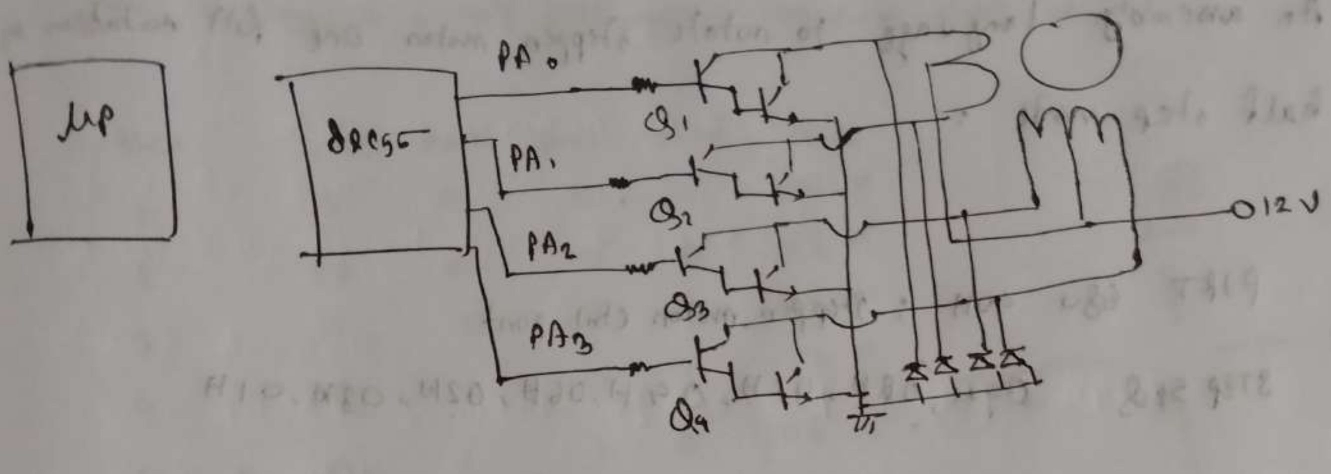
i) Allows 8 step pen sequence

ii) In full step, steppen moton ammature has a positioning of 45°, 135°, 225°, 315°, In full step, the anmature gets an addition of 4 angles 0°, 90°, 180°, 270°

∴ total of 8 angles 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, and netunning to 360° ≈ 0°

iii) The 8 step notation can be shown below:

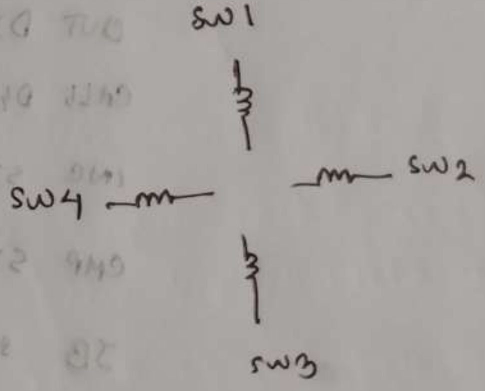




for half step the Input sequences on switches shall be

0 = OFF
1 = ON

step	SW1	SW2	SW3	SW4
1	1	0	0	0
2	1	1	0	0
3	0	1	0	0
4	0	1	1	0
5	0	0	1	0
6	0	0	1	1
7	0	0	0	1
8	1	0	0	1



and the repeat goes on

above shown is the procedure of half-step operation with stepper motor. I have drawn the system based on clock-wise rotation, with drawing & interfacing connected with μp 8086 & 8255 PPI.

3) ii) An assembly language to rotate stepper motor one full rotation half step mode :

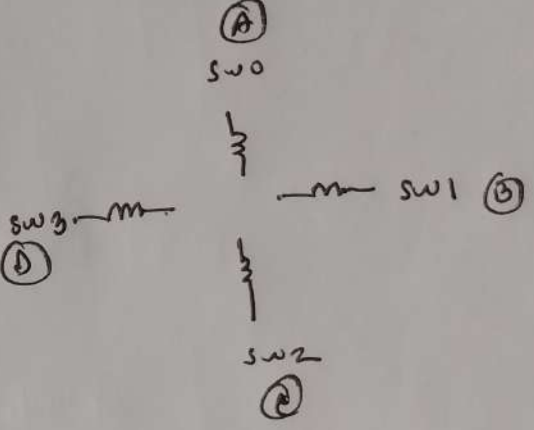
```
      PORT  EQU  40H  ; stepper motor ctrl port
      STEP SEQ   09H, 08H, 0CH, 04H, 06H; 02H, 03H, 01H

AGAIN: MOV SI, OFFSET STEPSEQ ; pointer for STEPSEQ table
      MOV DX, PORT

      STEP-LOOP:
            MOV AL, [SI]  ; Get step pattern
            OUT DX, AL    ; o/p to motor
            CALL DELAY
            INC SI        ; Move to next step
            CMP SI, OFFSET STEPSEQ +8  ; End of sequence ?
            JB  STEP-LOOP  ; If no, repeat
            LOOP AGAIN ; Repeat full rotation
            RET
   ROTATE  ENDP                              ROTATE   PROC NEAR
                                                      MOV CX,64
   DELAY   PROC NEAR
             MOV  BX, OFFFFH
   WAIT :  DEC  BX
           JNZ  WAIT
            RET
   DELAY   ENDP
```

for 8 steps in a half step motor. sequence shall be.

step	SW3	SW2	SW1	SW0	Hex
1	1	0	0	1	09 H
2	1	0	0	0	08 H
3	1	1	0	0	0C H
4	0	1	0	0	04 H
5	0	1	1	0	06 H
6	0	0	1	0	02 H
7	0	0	1	1	03 H
8	0	0	0	1	01 H



sequence is in anti-clockwise rotation