Square Wave Generator

| | |
|---|---|
| Time Period | 2.4×5 = 12ms |
| Amplitude | 1.6×2 = 3.2V |

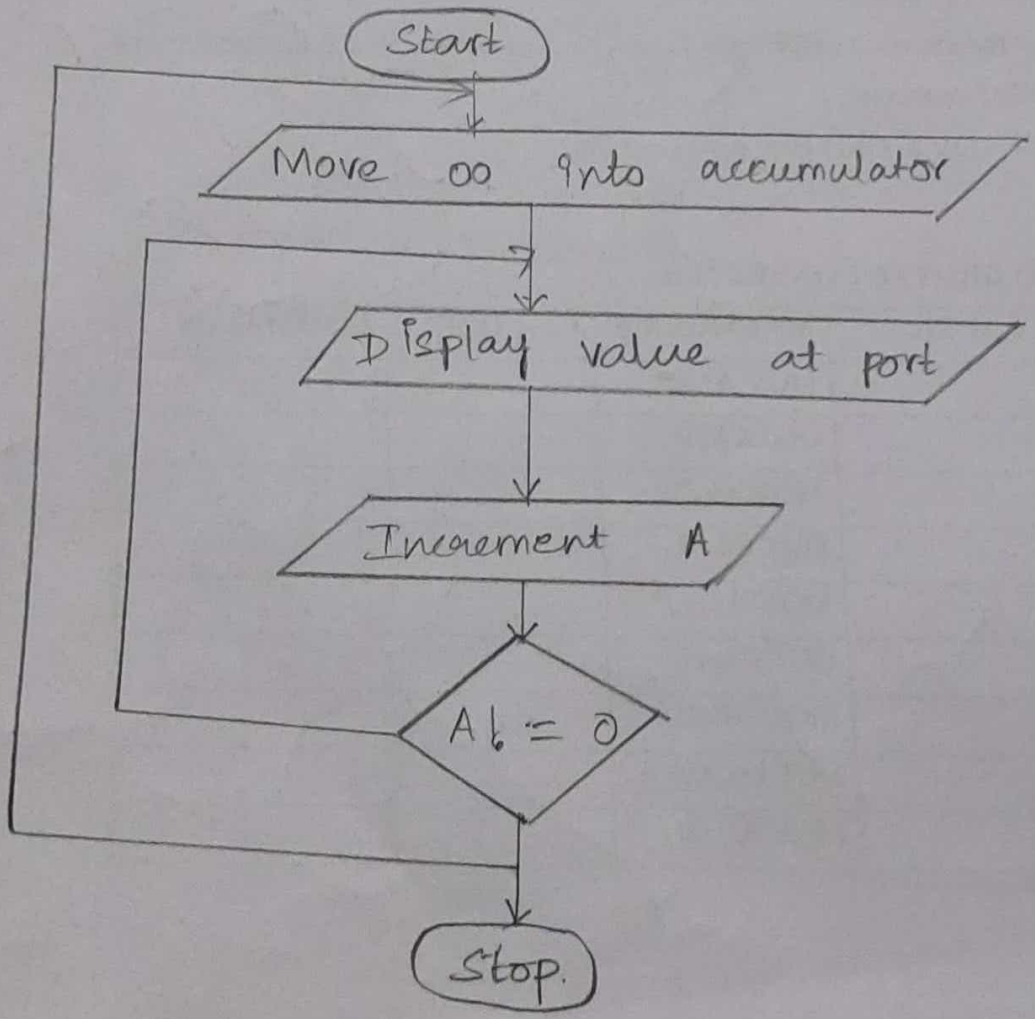
Sawtooth wave Generation

| | |
|---|---|
| Time period | 1.2×2 = 2.4ms |
| Amplitude | 1.3×10 = 13V |

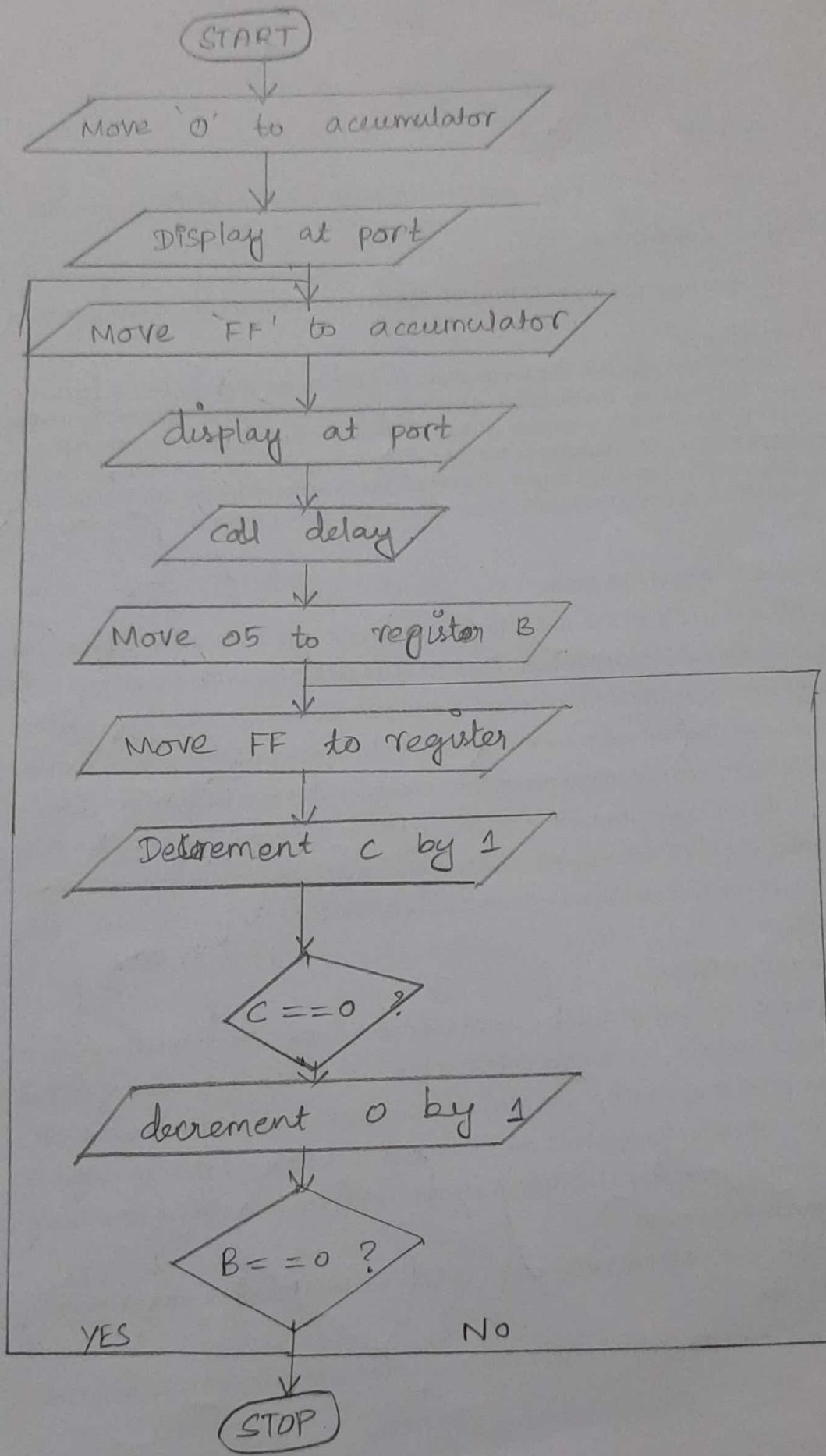
Triangular Wave Generation.

| | |
|---|---|
| Time Period | 2.8×2 = 5.6 |
| Amplitude | 1.5×10 = 15V |

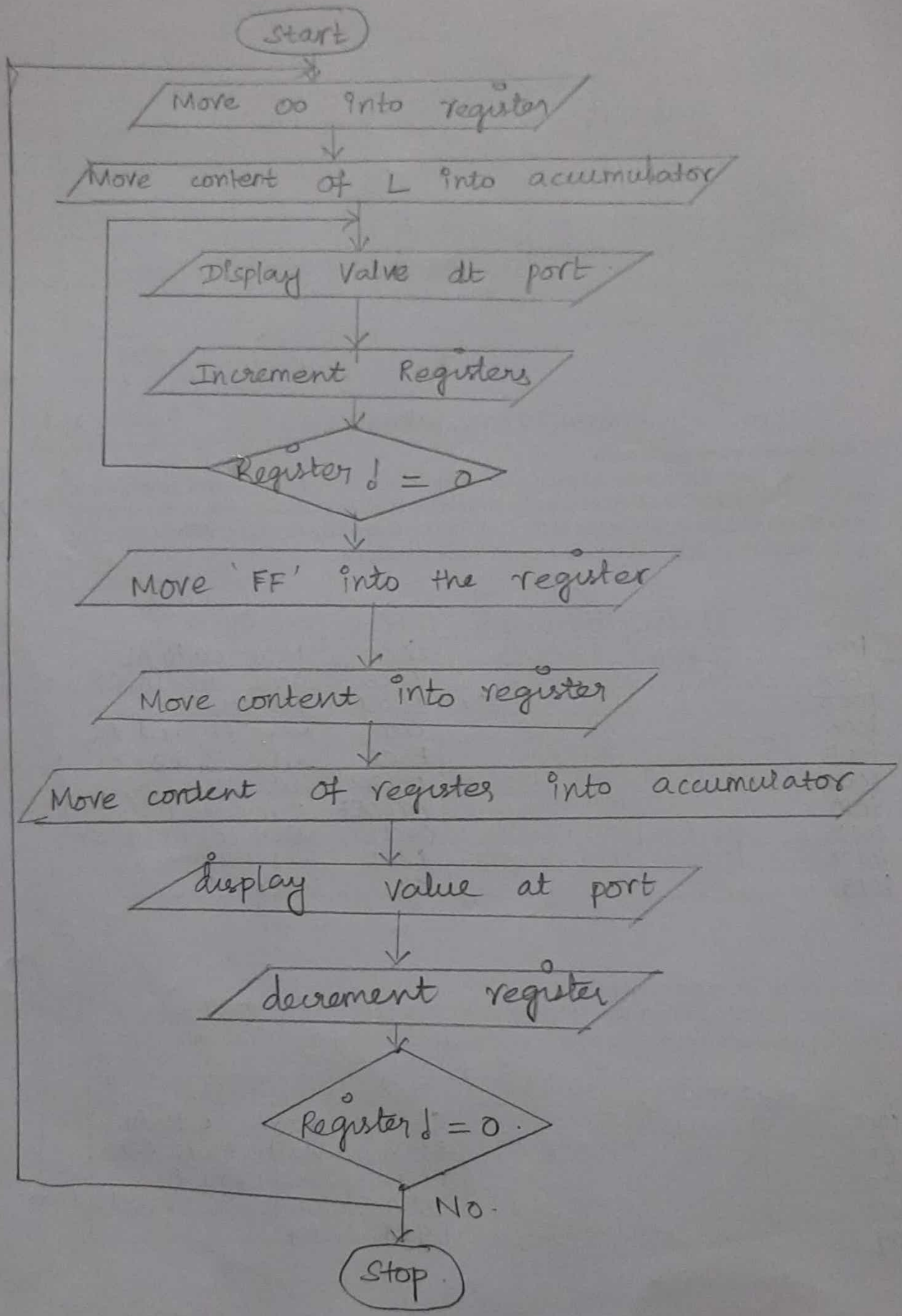
Sawtooth wave



Square Wave


START
Move '0' to accumulator
Display at port
Move 'FF' to accumulator
display at port
call delay
Move 05 to register B
Move FF to register
Decrement C by 1
C==0 ?
decrement 0 by 1
B==0 ?
YES
No
STOP

Triangular wave



NE 7: Pre Lab Questions

What is the basic principle of digital to analog convertor?

* It consists of binary weighted register and a amplifier each list consists of different values of resistance connected to circuit to gives different analog

Why DAC is interfaced with 8086?

* To generate different type of analog there should be equivalent contains digital data. So there DAC is integrated with 8086 which is generating the continuous digital data that will be converted to analog waveform.

) State any two applications where DAC is used?

* DAC are used to generate the video signals after processing for monitor.

* The modem connects the digital signal to analog signal to transmit it over telephone line.

) How many waveforms are generated in program state above?

* Square waveform

* Sawtooth waveform

* Triangular waveform.

5) Is it possible to generate a sine wave using DAC?

By interfacing DAC with it, sine wave can't be generated as DAC won't be able to generate the negative region of the wave.

Bsl lab Questions

1) Write a program to generate triangular wave

```
Start  : MOV BL, 00
Loop 1 : MOV AL, BL
         OUT C8, AL
         INC BL
         JNZ LOOP1
         MOV BL, FF
LOOP 2 : MOV AL, BL
         OUT C8, AL
         DEC BL
         JNZ LOOP2
         JMP START
```

2) What do you mean by DAC1 and DAC2?

* DAC1 and DAC2 are two difficult DAC integrated with 8086 each having -5V and +5V as reference voltage to generate the negative peak.

3) For a digital value of 7F, the approximate voltage is ___

As the Vpp is 10V ie. from -5V to +5V analog value at 7F is 5V.

egular intervals at DAC2, results in a square wave generation.

rogram:

| ADDRESS | LABEL | MNEMONICS | OPCODE | COMMENTS |
|---|---|---|---|---|
| 1000 | BEGIN | MOV AL,00 | C6C0 | Move 00 to AL |
| 1003 | | OUT C8,AL | E6C8 | Write AL in C8 |
| 1005 | | CALL 1010 DELAY | E808B00 | call 1010 |
| 1008 | | MOV AL,FF | C6C0 | Move FF and AL |
| 100B | | OUT C8,AL | E6C8 | Write AL to C8 |
| 100D | | CALL 1010 DELAY | E80200 | call 1010 |
| 1010 | | JMP 1000 BEGIN | E9EDEF | Jump to 1000 |
| 1013 | DELAY | MOV CX, 05FF | C7C1 | Move 05FF to CX |
| 1017 | START | LOOP 1013 START | E2FE | loop 1013 |
| 1019 | | RET | C3 | Stop. |

### 7.4.2 Saw tooth wave generation

Output digital data from 00 to FF in constant steps of 01 to DAC1.Repeat this sequence again and again. As a result a saw tooth is generated at DAC1 output.

| ADDRESS | LABEL | MNEMONICS | OPCODE | COMMENTS |
|---|---|---|---|---|
| 1000 | BEGIN | MOV AL,00 | C6C0 | Move 00 to AL |
| 1003 | LOOP1 | OUT C8,AL | E6C8 | Write AL to C0 |
| 1005 | | INC AL | FEC0 | Increment AL |
| 1007 | | JNZ 1002 LOOP1 | 75FA | Jump non zero to 1000 |
| 1009 | | JMP 1000 Begin | E9F4 | Stop. |

### 7.4.3 TRIANGLE WAVE GENERATION

| ADDRESS | LABEL | MNEMONICS | OPCODE | COMMENTS |
|---|---|---|---|---|
| 1000 | START | MOV BL,00 | C6C3 | Move 00 to BL |
| 1003 | L1 | MOV AL,BL | 88D8 | Move BL to AL |
| 1005 | | OUT C0,AL | E6C8 | Write AL in C8 |
| 1007 | | INC BL | FEC3 | Increase BL |
| 1009 | | JNZ 1002 | 75F8 | Jump to loop1 if C8 ≠ 0 |
| 100B | | MOV BL,FF | C6C3 | Move FF to BL |
| 100E | L2 | MOV AL,BL | 88D8 | Move BL to AL |
| 1010 | | OUT C0,AL | E6C8 | Write AL in C8 |
| 1012 | | DEC BL | FECB | Decrease BL |
| 1014 | | JNZ 100C | 75F8 | Jump to loop 2 if BL ≠ 0 |
| 1016 | | JMP 1000 | E9E7FF | Jump to start. |

**7.5 Pre-Lab Questions:**

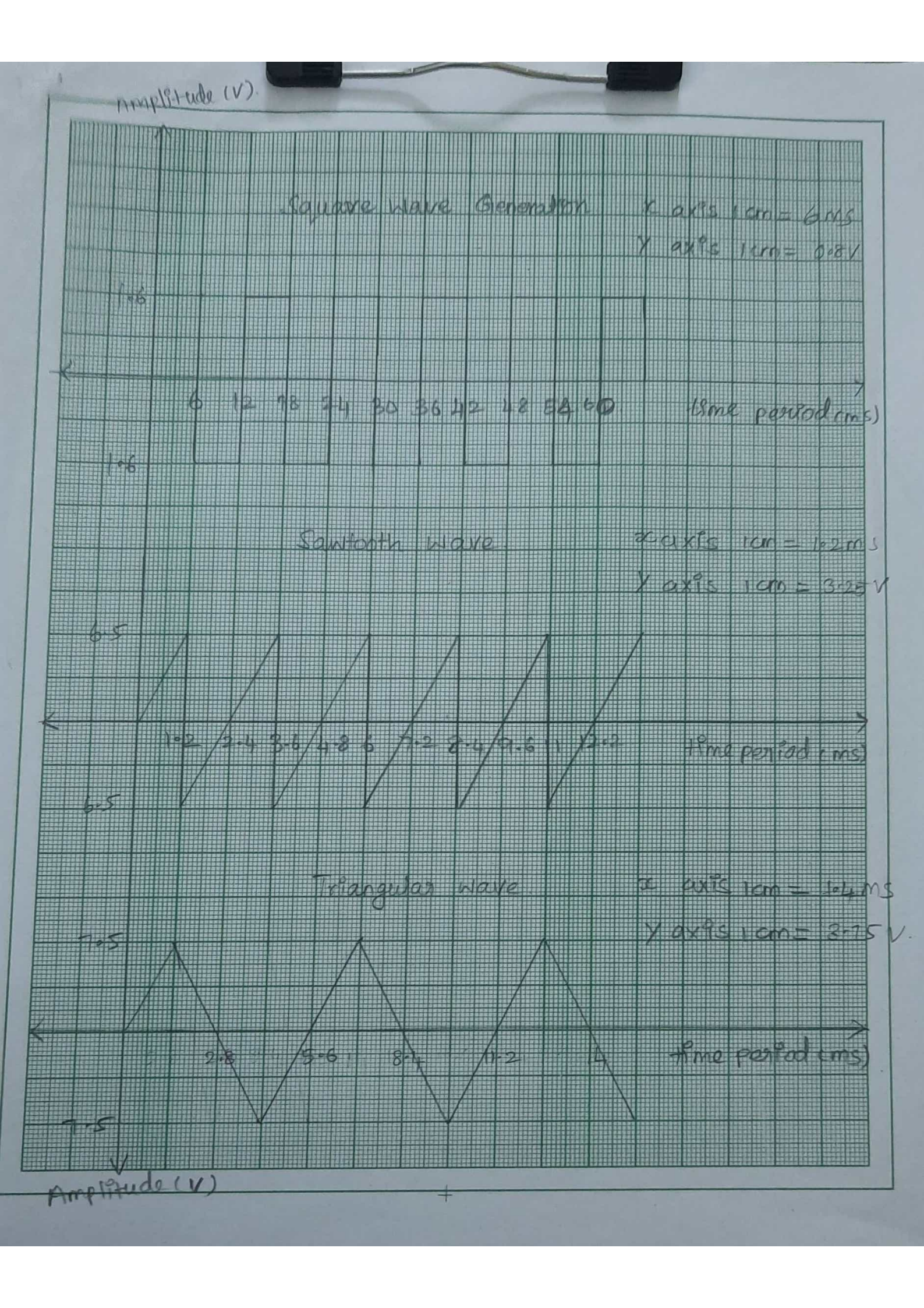
1. Why Analog to Digital conversion?
2. Why DAC is interfaced with 8086?
3. State any two applications where DAC is used?
4. How many waveforms are generated in the program stated above?
5. Is it possible to generate a sine wave using a DAC?

**7.6 Post-Lab Questions:**

1. Write a program to generate a triangular wave
2. Write a general algorithm for interfacing ADC with 8086.
3. Figure shows the interfacing of ADC 0804 to the 8086 microprocessor. Write an assembly language program to read the converted digital data through data bus.

Result:

Digital and analog interface is successfully performed using 8086.


Amplitude (V)
Square wave Generation
X axis 1cm = 6ms
Y axis 1cm = 0.8V
1.6
6 12 18 24 30 36 42 48 54 60
time period (ms)
-1.6
Sawtooth wave
x axis 1cm = 1.2ms
Y axis 1cm = 3.25V
6.5
1.2 2.4 3.6 4.8 6 7.2 8.4 9.6 10.8 12
time period (ms)
-6.5
Triangular wave
x axis 1cm = 1.4ms
Y axis 1cm = 2.75V.
7.5
2.8 5.6 8.4 11.2 14
time period (ms)
-7.5
Amplitude (V)