Microprocessor And Embedded Systems

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Section: A

* Design a schmitt trigger debouncing circuit using GaAs ($V_K = 1.2V$) diode where bouncing time, $t = 15ms$, Supply voltage, $V_{cc} = 8V$

Here, $V_{c\_final} = V_{d\_initial} = V_{cc} - V_K$

$= 8V - 1.2V$

$= 6.8V$

$t = 15ms = 15 \times 10^{-3} s$, $C = 1\mu F$, $V_{th} = 1.7V$

$$R_2 = \frac{-t}{C \ln \frac{V_{th}}{V_{d\_initial}}}$$

$$= \frac{-15 \times 10^{-3}}{1 \times 10^{-6} \ln \frac{1.7}{6.8}} = 10820\Omega = 10.82 k\Omega$$

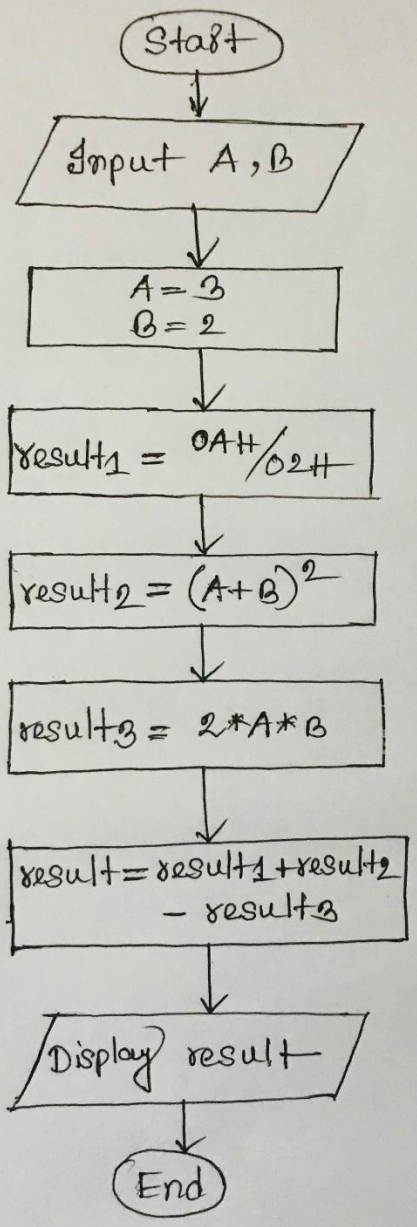
$$R = \frac{-t}{C \ln\left(1 - \frac{V_c}{V_{c\_final}}\right)}$$

$$= \frac{-15 \times 10^{-3}}{1 \times 10^{-6} \ln\left(1 - \frac{0.9}{6.8}\right)} = 105655\Omega = 105.66 k\Omega$$

$R = R_1 + R_2$

$R_1 = R - R_2 = 105.66 k\Omega - 10.82 k\Omega = 94.84 k\Omega$

(a) Design a flowchart to execute a function, $0AH/02H + (A+B)^2 - 2AB$, where $A=3, B=2$



(b) Prepare a program for the same function using basic concept of Assembly Language.

```
XOR AX, AX      ; clearing a register
MOV AX, 03      ; AX = 03
MOV BX, 02      ; BX = 02
DIV AX, BX      ; AX = AX / BX
MOV CX, AX      ; CX = AX
MOV AX, 03      ; AX = 3
MOV BX, 2       ; BX = 2
ADD AX, BX      ; AX = AX + BX
MOV DX, AX      ; DX = AX
MUL DX, DX      ; DX = DX * DX
ADD CX, DX      ; CX = CX + DX
MOV AX, 2       ; AX = 2
MOV BX, 3       ; BX = 3
MUL AX, BX      ; AX = AX * BX
MOV DX, 2       ; DX = 2
MUL AX, DX      ; AX = AX * DX
SUB CX, AX      ; CX = CX - AX

End
```

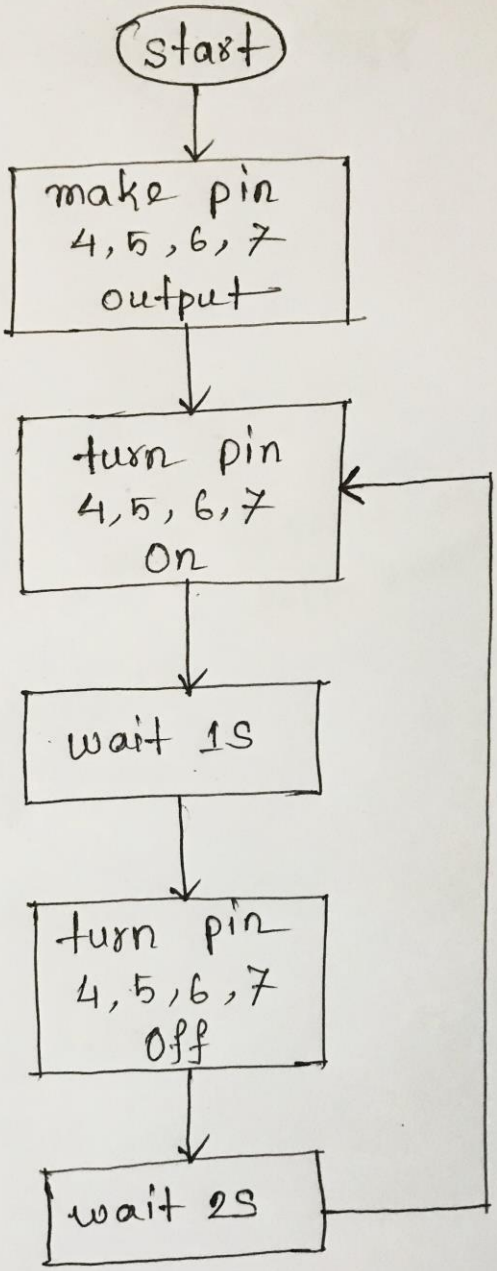
Assignment 02

1.
```
void setup ( )
{
    pinMode (4, Output);
    pinMode (5, Output);
    pinMode (6, Output);
    pinMode (7, Output);

}
void loop ( )
{
    digitalWrite (4, High);
    digitalWrite (5, High);
    digitalWrite (6, High);
    digitalWrite (7, High);
    delay (1000);
    digitalWrite (4, Low);
    digitalWrite (5, Low);
    digitalWrite (6, Low);
    digitalWrite (7, Low);
    delay (2000);

}
```

2.


start
make pin 4,5,6,7 output
turn pin 4,5,6,7 On
wait 1S
turn pin 4,5,6,7 Off
wait 2S

3.
```
int switch_read ;
int milisec = 1 ;
int prescalar = 1024 ;
int clock_freq = 16000000/prescalar ;
float clock_period = 1/(float) clock_freq ;
int timer_count = ((milisec * 0.001/clock_period) - 1);
int delay_timer (int miliseconds)
{   int count = 0 ;
    while(1)
    {  if (TCNT1 >= timer_count)
       {  TCNT1 = 0 ;
          count ++ ;
          if (count == miliseconds)
          {  count = 0 ;
             break ;
          }
       }
    }
    return 0 ;
}
```

```
void setup()
{
    pinMode(4, Output);
    pinMode(5, Output);
    pinMode(6, Input);

    TCCR1A = 0b00000000;
    TCCR1B = 0b00000101;
    TCNT1 = 0;
}
void loop()
{
    digitalWrite(4, High);
    delay-timer(1000);
    digitalWrite(4, Low);
    delay-timer(4000);

    switch-read = digitalRead(6);
    if(switch-read == High)
    {
        digitalWrite(5, High);
    }
    else
    {
        digitalWrite(5, Low);
    }
}
```

4. Equation = $(AB+B^2)^2 - 4A^2 + 9AB$

where, $A = 2$ and $B = 5$

```
XOR AX, AX      ; clearing a register
MOV AX, 2       ; AX = 2
MOV BX, 5       ; BX = 5
MUL AX, BX      ; AX = AX * BX
MOV CX, AX      ; CX = AX
MOV AX, 5       ; AX = 5
MUL AX, AX      ; AX = AX * AX
ADD CX, AX      ; CX = CX + AX
MUL CX, CX      ; CX = CX * CX
MOV AX, 2       ; AX = 2
MUL AX, AX      ; AX = AX * AX
MOV BX, 4       ; BX = 4
MUL AX, BX      ; AX = AX * BX
MOV DX, AX      ; DX = AX
SUB CX, DX      ; CX = CX - DX
MOV AX, 9       ; AX = 9
MOV BX, 2       ; BX = 2
MUL AX, BX      ; AX = AX * BX
MOV DX, 5       ; DX = 5
MUL AX, DX      ; AX = AX * DX
ADD CX, AX      ; CX = CX + AX

End
```