Name & Reg No: ______________________

Department of Computer Systems Engineering
University of Engineering & Technology
Peshawar

Microprocessor Based System Design (MBSD)
6th Semester Mid-Term, Spring 2022

Max. Time: 2 hours **Max. Points: 20**

Instructions:

1. Attempt ALL questions.
2. Exam is open book and open notes.
3. Cell phones and Laptops are strictly prohibited.
4. Exam is worth **20%** of the final grade.

Q 1). **8-points**

CLO-5/PLO-3 [Cognitive Domain: Synthesis]

Design a system, where the Software in C will generate, a signal of

A. 0.5KHz with a duty cycle of 25% on P2.0 pin.

B. Whenever a user presses a button at (P3.2), the signal toggles to 1KHz with a duty cycle of 50%.

C. Again, pressing the same button will generate a signal of 2KHz with a duty cycle of 75%. A third time button press will result in the generation of case A and so on.

- Draw the schematic diagram showing clearly the button circuit and oscilloscope.
- Draw the timing diagram with cursors clearly showing the time period with appropriate units.
- Assuming oscillator clock of 24MHz is used.
- Use **timer** interrupt.

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Q 2). **8-points**

CLO-3/PLO-2 [Cognitive Domain: Analysis]

Analyze the program below and fill the table.

```
#include <reg51.h>
#include <stdio.h>
unsigned char x = 0x37, y=5, z = 0, R = 9 ;
void main(void)
 {

  while(y>0){
  x = 0x80 - y;
  x^= x;
  x += 0x7F;
  x  = x>>y;
  R += (R << 1);
  z += (x+y+R);

  y--;
    P1 = x;
 }
```

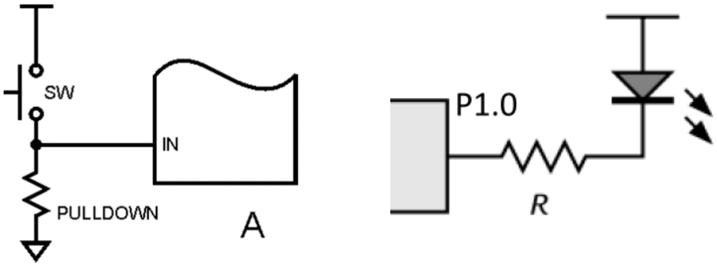
	X	R	Z
Y = 5	**3**	**27 (0x1B)**	**35 (0x23)**
Y = 4	**7**	**81 (0x51)**	**127 (0x7F)**
Y = 3	**15 (0x0F)**	**243 (0xF3)**	**132 (0x84)**
Y = 2	**31 (0x1F)**	**217 (0xD9)**	**126 (0x7E)**
Y = 1	**63 (0x3F)**	**139 (0x8B)**	**73 (0x49)**

Q 3). **4-points**

CLO-2/PLO-1 [Cognitive Domain: Comprehension]

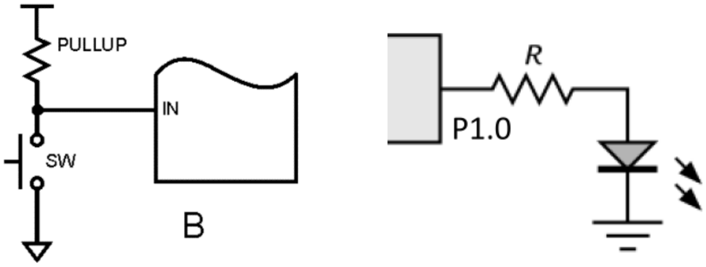
Translate the following tasks into C code.

i) If we have an active-high button (A) at **P2.5** pin and an ***active-low*** *LED at P1.0* as shown below,



P2 |=0x20 ;
Scan the button using polling
While ((P2 & 0x20) ==1)
{
P1 &=0xFE; _____________ *// Button pressed, TURN ON the **active-low** LED at P1.0*
}

ii) If we have an active-low button (B) at **P2.5** and an **active-high** LED at P1.0 as shown below,



P2 |=0x20 ;
Scan the button, using polling
While ((P2 & 0x20) == 0))
{
P1 |= 0x01; ________________________*// Button pressed, TURN ON the **active-high** LED at P1.0*
}