Name & Reg No: _____

Department of Computer Systems Engineering
University of Engineering & Technology
Peshawar

Microprocessor Based System Design (MBSD)
6th Semester Mid-Term, Spring 2021

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

Instructions:

1. Attempt ALL questions.
2. Exam is open book and open notes.
3. Exam is worth **20%** of the final grade.

Q 1). **5-points**

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

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

A. 1KHz with a duty cycle of 20% on P2.0 pin.

B. Whenever a user presses a button at (P3.2), the signal toggles to 2KHz with a duty cycle of 40%.

C. Again, pressing the same button will generate a signal of 4KHz with a duty cycle of 60%. 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. **10-points**

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

At a parking plaza, assume there are only two lanes of cars. One lane is designated for entrance to the plaza from outside road and another lane is used for exiting from the plaza. We have connected two sensors which sends a signal (high-to-low edge) to our embedded system. Whenever a car enters through the gate of plaza (a pulse is detected at P3.2). Another sensor is installed at the exit gate (a pulse is detected at P3.3 when a car exits).

Use an 89C51 to count the number of cars inside the plaza after one minute. As soon the one-minute time is over, it is indicated by turning ON an led at P3.1 pin, send the final value of count to Port-2 and finally goes into an infinite loop.

- Draw schematic along with timing diagram. Oscillator frequency is 12MHz.
- Port-2 is connected to seven segment display.

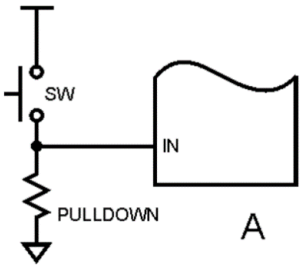
Hint: Use timer interrupt. Use C for programming.
Entry and exit of a car can be simulated using a button press functionality.
Zip a folder that contain the following two items,
1). Proteus project.
2). A word file containing schematic, code and timing diagram.
Submit the Zip folder.
No comments in code -> **Zero** score
Two students submitting same design-> **Both** get zero.

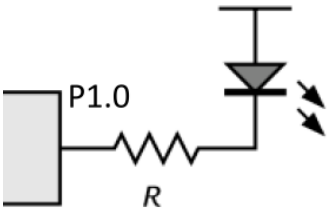
Q 3). **5-points**

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

Translate the following tasks into C or assembly code.

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





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

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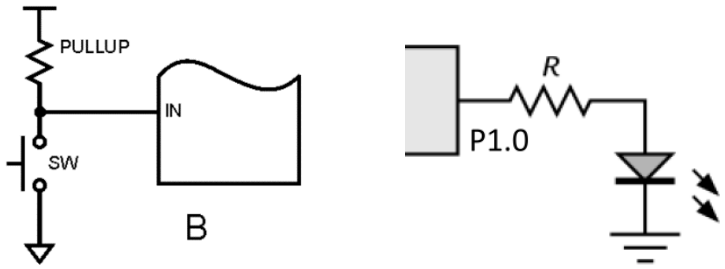
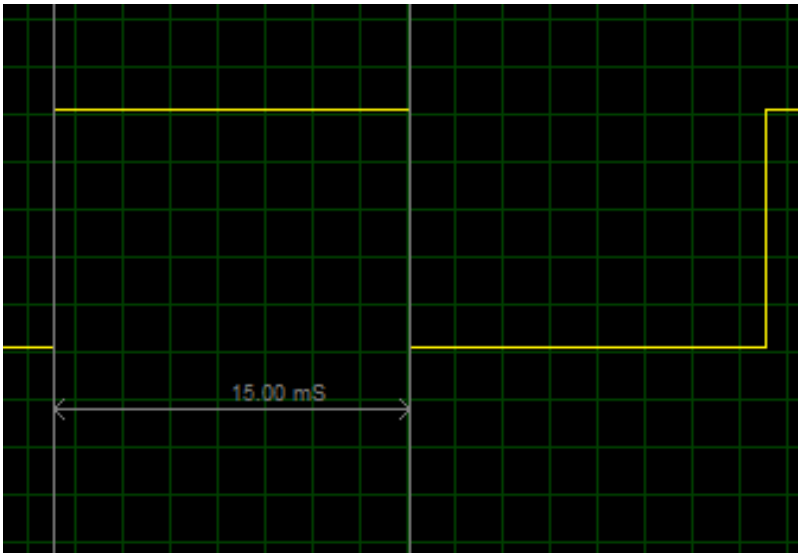
b) If we have an active-low button (B) at **P2.5** and an **active-high** LED at P1.0 as shown below,



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

c) Fill in the blanks for a code that will generate the following timing diagram on P1.0 pin, using timer-1 (Assume clock = 12 MHz).



TMOD = 0x_ _; TH0 = 0x_ _; TL0 = 0x_ _; IE = 0x_ _;

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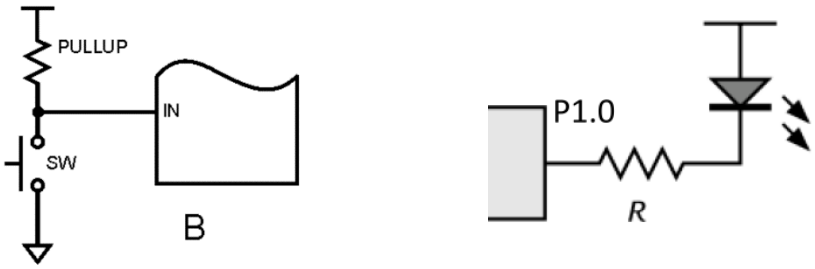
d) If we have an active-low button (B) at **P3.2** pin and an ***active-low*** *LED at P1.0* as shown below,



P3 = _____;
//Scan the button, using polling
While (_____)
{
P1 = _____; // Button pressed, TURN ON the ***active-Low*** *LED at P1.0*
}

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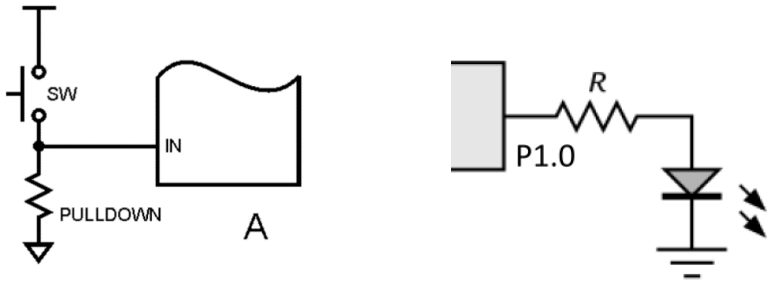
e) If we have an active-high button (A) at **P3.3** pin and an ***active-high*** *LED at P1.0* as shown below,



P3 = _____;
//Scan the button, using polling
While (_____)
{
P1 = _____; // Button pressed, TURN ON the ***active-high*** *LED at P1.0*
}