BECS 31421
EXPERIMENT 04

DATE 11/4/2024

Interrupt handling with a PIC Microcontroller

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Source Code

```
void interrupt() {
    // Step 7: Interrupt service routine
    if (INTCON.INTF == 1) { // Check external interrupt flag
        // Step 8: Set PORTB values on interrupt
        PORTB.RB1 = 1;
        PORTB.RB2 = 0;
        Delay_ms(200); // 200 ms delay

        // Step 9: Toggle values
        PORTB.RB1 = 0;
        PORTB.RB2 = 1;
        Delay_ms(200); // 200 ms delay

        INTCON.INTF = 0; // Clear external interrupt flag
    }
}

void main() {
    // Step 2: Configuration
    TRISB = 0b00000001;   // RB0 as input, others as output
    TRISA = 0b00000000;   // All PORTA as output
    CMCON = 0x07;         // Disable comparators (disables RA5 special
function)
    OPTION_REG = 0b10000000; // INT on rising edge, no prescaler

    // Step 3: Enable interrupts
    INTCON.GIE = 1;   // Global interrupt enable
    INTCON.PEIE = 1;  // Peripheral interrupt enable
    INTCON.INTE = 1;  // Enable RB0 external interrupt

    // Step 4: Infinite loop
    while (1) {
        // Step 5: Set PORT initial values
        PORTB.RB2 = 0;  // RB2 low
        PORTA.RA0 = 1;  // RA0 high
        PORTA.RA1 = 0;  // RA1 low
        Delay_ms(50);   // 50 ms delay

        // Step 6: Toggle
        PORTA.RA0 = 0;  // RA0 low
        PORTA.RA1 = 1;  // RA1 high
        Delay_ms(50);   // 50 ms delay

        INTCON.INTF = 0; // Clear interrupt flag (precaution)
    }
}
```

```
void interrupt() {
    // Step 7: Interrupt service routine
    if (INTCON.INTF == 1) { // Check external interrupt flag
        // Step 8: Set PORTB values on interrupt
        PORTB.RB1 = 1;
        PORTB.RB2 = 0;
        Delay_ms(200); // 200 ms delay

        // Step 9: Toggle values
        PORTB.RB1 = 0;
        PORTB.RB2 = 1;
        Delay_ms(200); // 200 ms delay

        INTCON.INTF = 0; // Clear external interrupt flag
    }
}
```

```
void main() {
    // Step 2: Configuration
    TRISB = 0b00000001;    // RB0 as input, others as output
    TRISA = 0b00000000;    // All PORTA as output
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    // Step 3: Enable interrupts
    INTCON.GIE = 1;    // Global interrupt enable
    INTCON.PEIE = 1;   // Peripheral interrupt enable
    INTCON.INTE = 1;   // Enable RB0 external interrupt

    // Step 4: Infinite loop
    while (1) {
        // Step 5: Set PORT initial values
        PORTB.RB2 = 0;   // RB2 low
        PORTA.RA0 = 1;   // RA0 high
        PORTA.RA1 = 0;   // RA1 low
        Delay_ms(50);    // 50 ms delay

        // Step 6: Toggle
        PORTA.RA0 = 0;   // RA0 low
        PORTA.RA1 = 1;   // RA1 high
        Delay_ms(50);    // 50 ms delay

        INTCON.INTF = 0; // Clear interrupt flag (precaution)
    }
}
```

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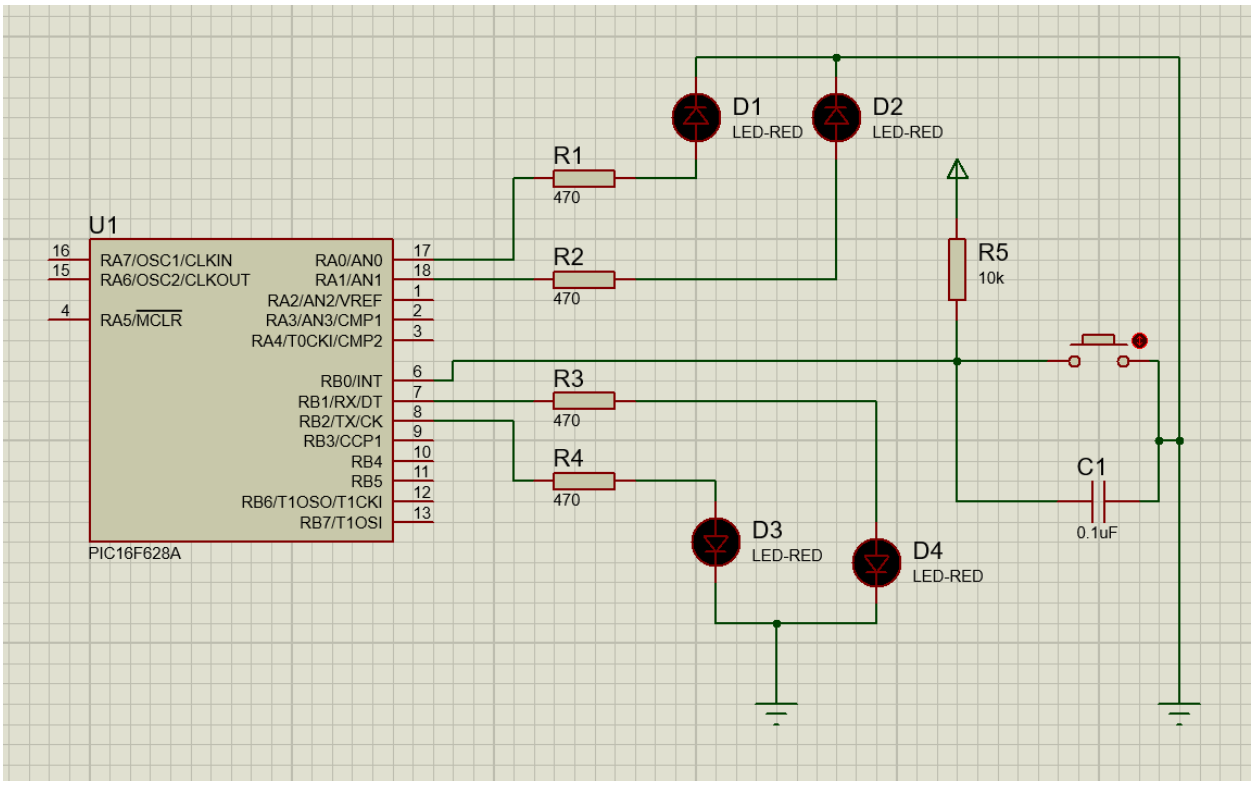
Circuit



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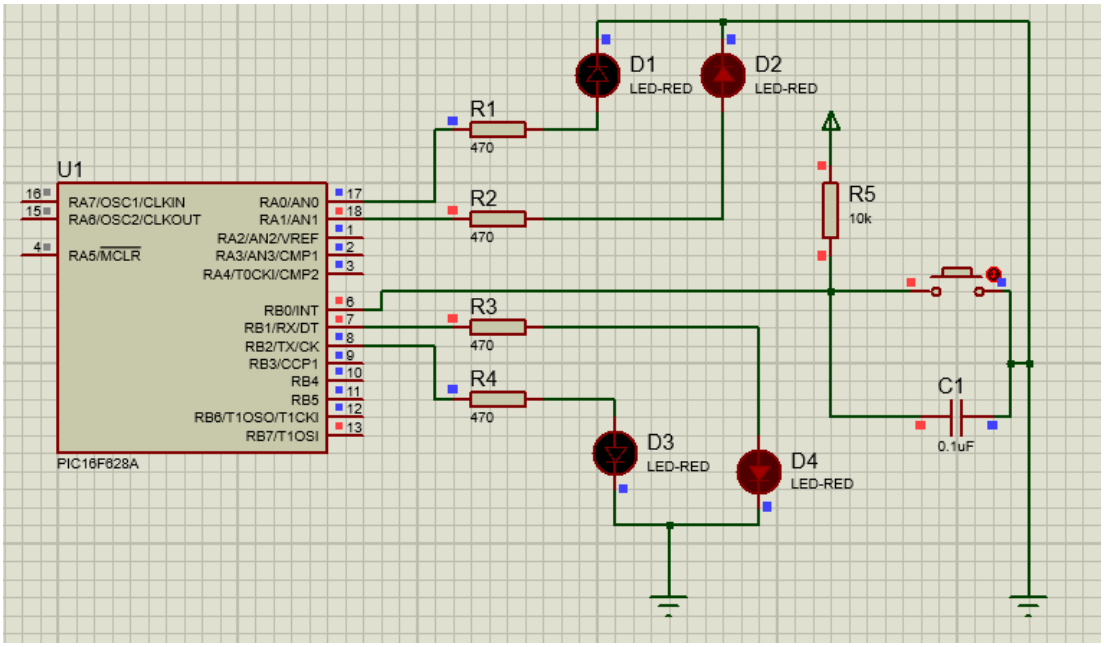
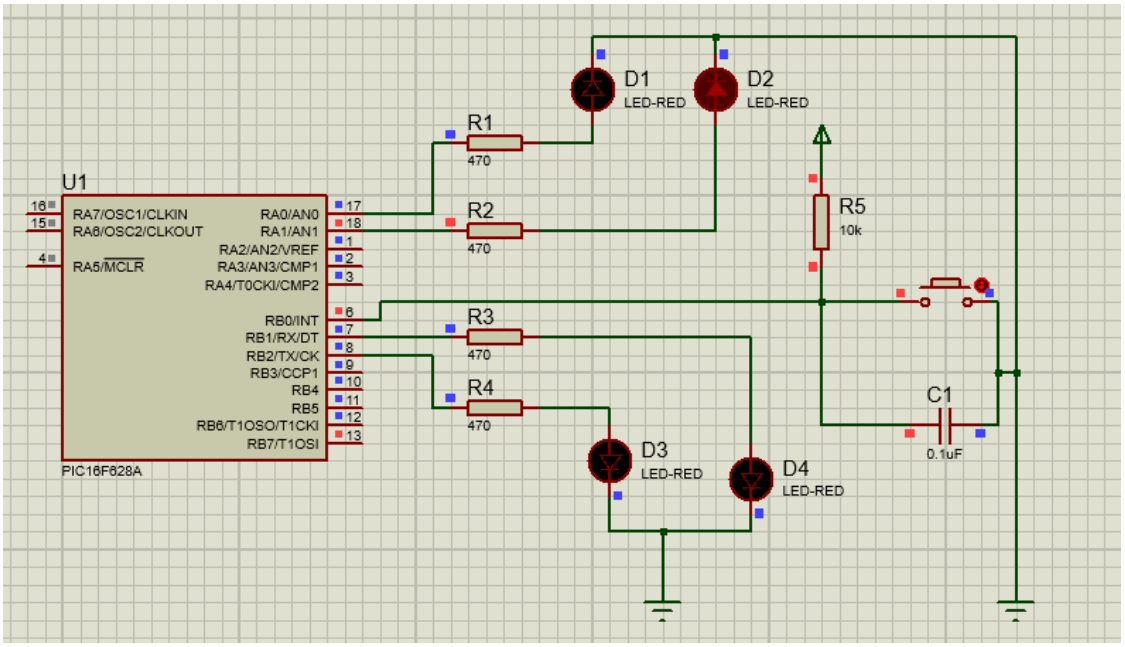
Observations





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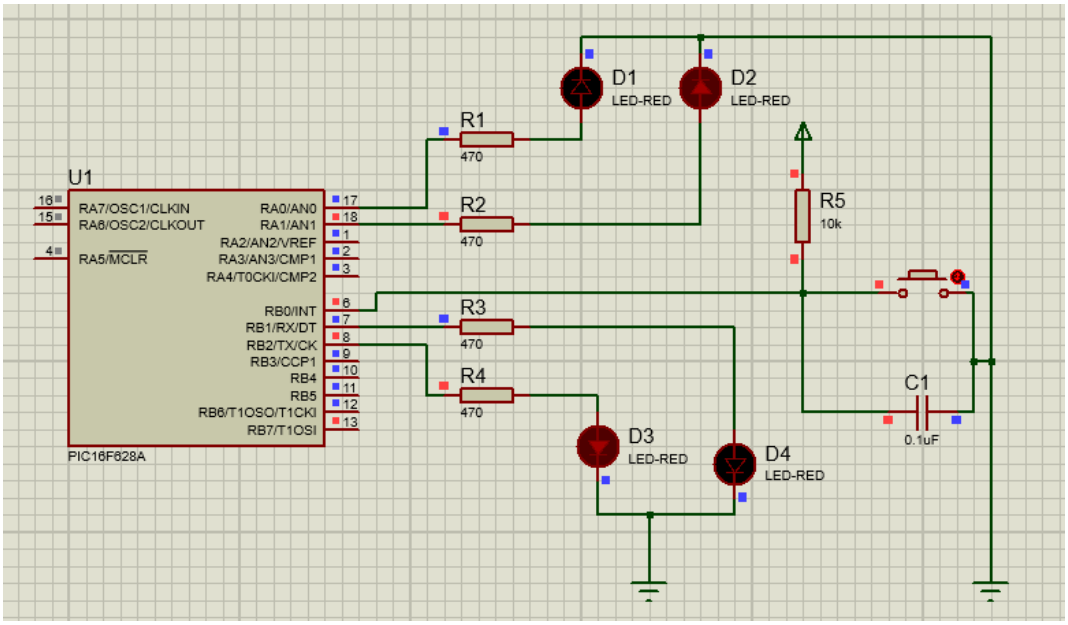

Discussion

This laboratory experiment focused on understanding and implementing interrupt handling mechanisms using the PIC16F628A microcontroller. Interrupts are critical features in embedded systems that allow the microcontroller to respond immediately to external or internal events without continuously polling for changes. The experiment emphasized the distinction between **internal interrupts** such as Timer0 overflow and USART communication and **external interrupts**, which originate from changes in external pins.

The primary objective of this experiment was to demonstrate the use of an **external interrupt** triggered through the **RB0/INT pin**. The system was configured so that when an external signal (e.g., button press) occurred on RB0, the microcontroller interrupted its main execution flow and entered a predefined **Interrupt Service Routine (ISR)** to handle the event. Key registers such as INTCON were used to enable and monitor the interrupt signals, while GIE and INTE bits ensured proper interrupt execution.

Through this setup, we gained hands-on experience in configuring and using interrupts, showcasing their efficiency in handling asynchronous events without affecting the main program's continuous operation.