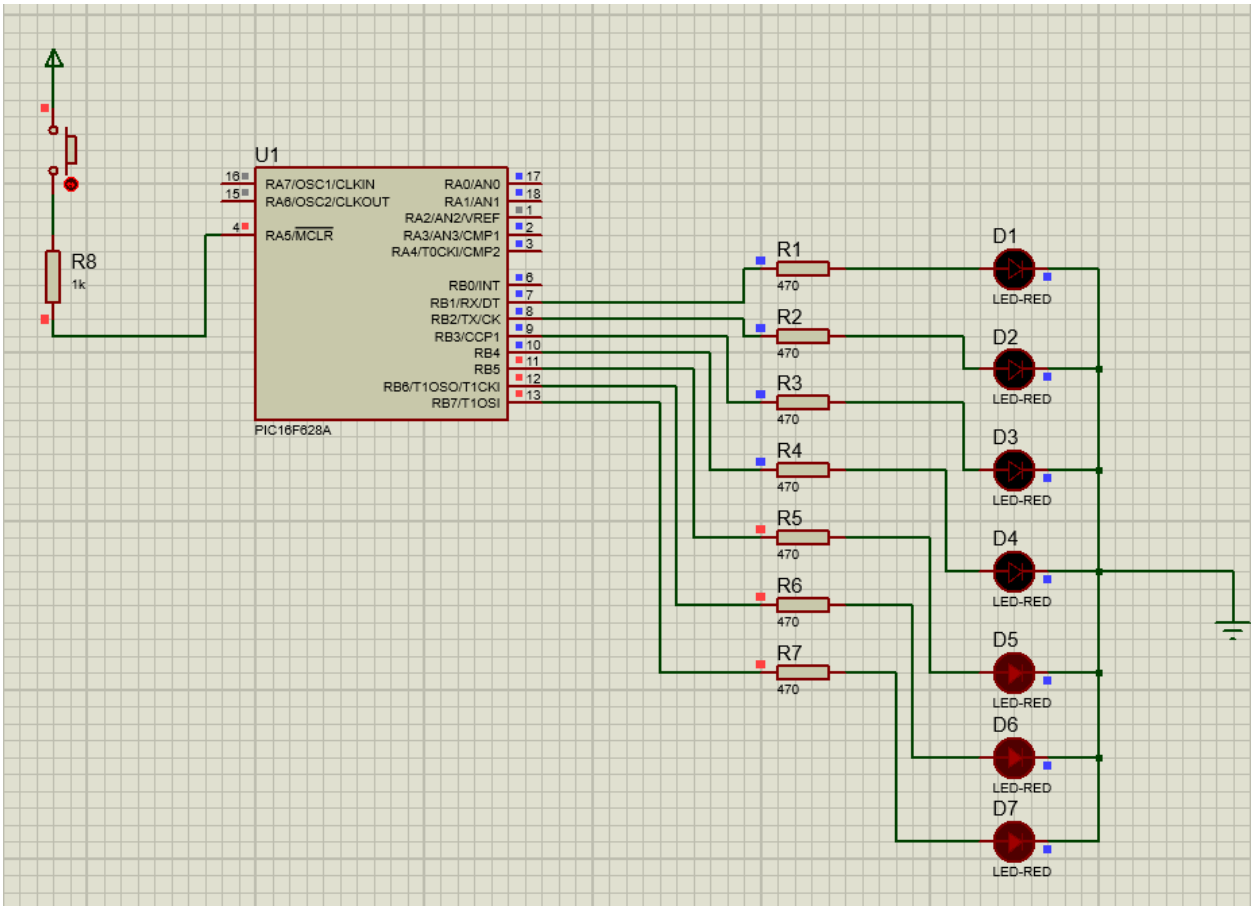
Exercises (lab 03)
EC/2021/005

Q1: Write a C program and implement Proteus simulation and the physical setup for a Knight Rider LED chaser, where the direction of the light movement is controlled by a switch. In this implementation, when the next LED lights up, the previous LED should remain ON.



Exercises (lab 03)
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Code

```
sbit sw at RA2_bit;

void rider() {
  char x;
  int i;
  TRISB = 0b00000000;   // Set PORTB as output
  TRISA = 0b00000100;   // Set RA2 as input (SW connected)

  if (sw == 1) {
    PORTB = 0b00000001;
    Delay_ms(200);
    x = 0b00000010;

    for (i = 0; i < 7; i++) {
      PORTB = PORTB | x;   // Keep previous LEDs ON
      x = x << 1;
      Delay_ms(250);
    }
  } else {
    PORTB = 0b10000000;
    x = 0b01000000;
    Delay_ms(200);

    for (i = 7; i =< 7; i--) {
      PORTB = PORTB | x;
      x = x >> 1;
      Delay_ms(250);
    }

  }
}

void main() {
  CMCON = 0x07;         // Disable comparator
  TRISA = 0b00000100;    // RA2 as input
  TRISB = 0x00;         // PORTB as output
  PORTB = 0x00;

  while (1) {
    rider();
  }
}
```

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```
sbit sw at RA2_bit;

void rider() {
    char x;
    int i;
    TRISB = 0b00000000;    // Set PORTB as output
    TRISA = 0b00000100;    // Set RA2 as input (SW connected)

    if (sw == 1) {
        PORTB = 0b00000001;
        Delay_ms(200);
        x = 0b00000010;

        for (i = 0; i < 7; i++) {
            PORTB = PORTB | x;    // Keep previous LEDs ON
            x = x << 1;
            Delay_ms(250);
        }
    } else {
        PORTB = 0b10000000;
        x = 0b01000000;
        Delay_ms(200);

        for (i = 0; i < 7; i++) {
            PORTB = PORTB | x;
            x = x >> 1;
            Delay_ms(250);
        }
    }
}
```

```
void main() {
    CMCON = 0x07;            // Disable comparator
    TRISA = 0b00000100;      // RA2 as input
    TRISB = 0x00;            // PORTB as output
    PORTB = 0x00;

    while (1) {
        rider();
    }
}
```

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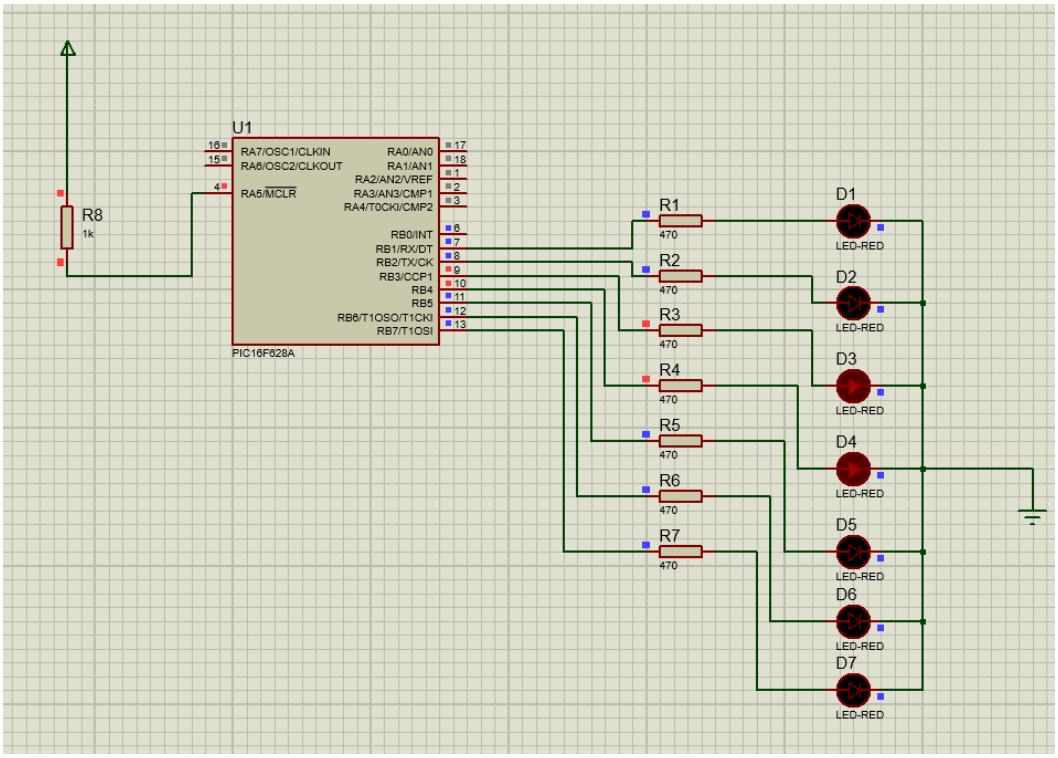
Q2: Create a LED chaser pattern where it begin from the middle and going to go to the two ends




```
void knightrider(void) {
    int i;
    char left = 3;
    char right = 4;
    TRISB = 0x00;
    PORTB = 0x00;

    for (i = 0; i < 4; i++) {
        PORTB |= (1 << left);   // Light LED from center to left
        PORTB |= (1 << right);  // Light LED from center to right
        Delay_ms(200);
        left--;
        right++;
    }
}
void main() {
    CMCON = 0x07;
    while (1)
        knightrider();
}
```

Code

Exercises (lab 03)
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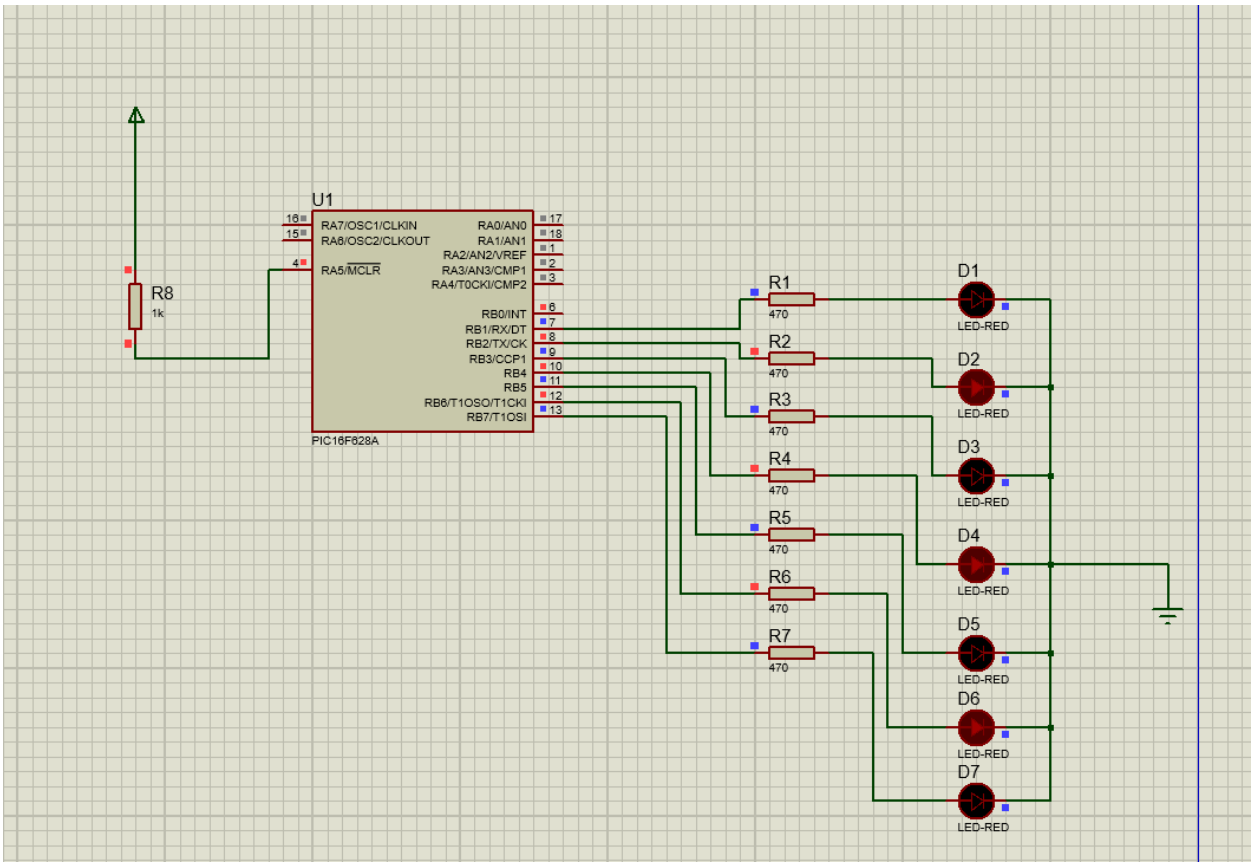
```
void knightrider(void) {
    int i;
    char left = 3;
    char right = 4;

    TRISB = 0x00;
    PORTB = 0x00;

    for (i = 0; i < 4; i++) {
        PORTB |= (1 << left);   // Light LED from center to left
        PORTB |= (1 << right);  // Light LED from center to right
        Delay_ms(200);
        left--;
        right++;
    }
}

void main() {
    CMCON = 0x07;
    while (1)
        knightrider();
}
```

Exercises (lab 03)
EC/2021/005

Q3: Create a LED Chaser Pattern where the light movement skips a LED and continue.



Code

```
void knightrider(void) {
    int i;
    TRISB = 0x00;
    PORTB = 0x00;

    for (i = 0; i <= 6; i += 2) {// Forward skipping LEDs
        PORTB |= (1 << i);
        Delay_ms(150);
    }
    for (i = 7; i >= 1; i -= 2) {// Backward skipping LEDs
        PORTB |= (1 << i);
        Delay_ms(200);
        if (i == 1) break;  // Prevent infinite loop
    }
}
void main() {
    CMCON = 0x07;
    while (1)
        knightrider();
```

}

```
void knightrider(void) {
    int i;
    TRISB = 0x00;
    PORTB = 0x00;

    // Forward skipping LEDs
    for (i = 0; i <= 6; i += 2) {
        PORTB |= (1 << i);
        Delay_ms(150);
    }

    // Backward skipping LEDs
    for (i = 7; i >= 1; i -= 2) {
        PORTB |= (1 << i);
        Delay_ms(200);
        if (i == 1) break;  // Prevent infinite loop
    }
}

void main() {
    CMCON = 0x07;
    while (1)
        knightrider();
}
```