|  |  |  |  |
| --- | --- | --- | --- |
| **Course Name:** | **Elements of Electrical and Electronics Engineering** | **Semester:** | **I/II** |
| **Date of Performance:** | **25/10/2021** | **Batch No:** | A3 |
| **Faculty Name:** |  | **Roll No:** | 16010121051 |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **/ 25** |

**Experiment No: 2**

**Title:** **Battery level Indicator.**

|  |
| --- |
| **Aim and Objective of the Experiment:** |
| * To understand voltage division concept, current division concept and principle of operation of LED. * To develop a micro project (Battery level indicator) based on the concepts learned in the form of various task performed in the experiment. |

|  |
| --- |
| **COs to be achieved:** |
| **CO1:** Analyze resistive networks excited by DC sources using various network theorems. . |

|  |
| --- |
| **Circuit Diagram/ Block Diagram:** |
| **Task 1: Voltage division Concept and its verification on breadboard**    **Task 2**: **Current division Concept**    **Task 3: Turn on an LED and measure its turn-on voltage**    **Task 4: Battery Level Indicator Circuit** |

|  |
| --- |
| **Stepwise-Procedure:** |
| 1. Make the connections as shown in the circuit diagram for Task1. Measure the voltages Va, Vb  and current Is for Task 1 and compare with calculated results.  2. Make the connections as shown in the circuit diagram for Task2. Measure the currents I1,I2, I3  and IS and compare with calculated results.  3. Make the connections as shown in the circuit diagram for Task3. Measure the voltages VS, VD,  VR1 for Case1 and Case 2.  4. Make the connections as shown in the circuit diagram for Task4. Measure the voltages across  LED and resistors. |

|  |
| --- |
| **Observation Table:** |
| **Observation Table 1 ( Task 1)**   |  |  |  | | --- | --- | --- | | **Voltages / Currents** | **Theoretical reading** | **Practical reading** | | **Va(V)** | **6v** | **6v** | | **Vb(V)** | **3v** | **3v** | | **IS(mA)** | **3mA** | **3mA** |   **Calulations (Task1):**  **Calclaute Va and Vb using the formula given below:**  **Observation Table 2**   |  |  |  | | --- | --- | --- | | **Currents** | **Theoretical reading** | **Practical Reading** | | **I1 (mA)** | **9mA** | **9mA** | | **I2 (mA)** | **9mA** | **9mA** | | **I3 (mA)** | **9mA** | **9mA** | | **IS (mA)** | **27mA** | **27mA** |   **Calculations (Task2):**  **Calculate I1, I2, I3 and IS using the formula given below:**        **Observation (Task 3):**  **Case 1 : LED just turn’s ON**   |  |  | | --- | --- | | **Parameters** | **Practical reading** | | **VS (V)** | **5V** | | **VD (V)** | **2.20V** | | **VR1 (V)** | **2.80V** |   **Case 2 : LED turn’s ON ( glows brightly)**   |  |  | | --- | --- | | **Parameters** | **Practical reading** | | **VS** | **9V** | | **VD** | **2.20V** | | **VR1** | **6.80V** |   **Observations (Task4):**  **Case 1 : Supply Voltage Levels recording**   |  |  | | --- | --- | | **Scenario** | **Range of Battery voltage (V)** | | **LED 1 ON** | **2.9V** | | **LED 1 ON & LED 2 ON** | **6.85V** | | **LED 1 ON & LED 2 ON &**  **LED 3 ON** | **7.92V** | | **ALL LEDs ON** | **12V** |   **Case Case 2: Status of voltages in the circuit when all LEDs On**   |  |  | | --- | --- | | **Voltages** | **Practical reading (in Volts)** | | **VLED 1** | **2.28V** | | **VLED 2** | **2.25V** | | **VLED 3** | **2.22V** | | **VLED 4** | **2.20V** | | **VR1** | **9.72V** | | **VR2** | **7.48V** | | **VR3** | **5.25V** | | **VR4** | **3.05V** |   Screenshot of Output: |

|  |
| --- |
| **Post Lab Subjective/Objective type Questions:** |
| * Mention some applications of battery level indicator.   Battery level indicator finds its applications in following things:-  Computers  Computers may give a signal to users that an internal standby battery needs replacement. Portable computers using rechargeable batteries generally give the user some indication of the remaining operating time left on the battery. A Smart Battery System uses a controller integrated with an interchangeable battery pack to provide a more accurate indication of the state of battery charge.  Electronic Devices  A battery indicator is a feature of many electronic devices. In mobile phones, the battery indicator usually takes the form of a bar graph - the more bars that are showing, the better the battery's state of charge.  Automobiles  Some automobiles are fitted with a battery condition meter to monitor the starter battery. This meter is, essentially, a voltmeter but it may also be marked with colored zones for easy visualization.  Many newer cars no longer offer voltmeters or ammeters; instead, these vehicles typically have a light with the outline of an automotive battery on it. This can be somewhat misleading as it may be confused for an indicator of a bad battery when in reality it indicates a problem with the vehicle's charging system.   * Explain practical usage of Voltage- division concept?   Voltage division concept is used in:-  Voltage dividers are used for adjusting the level of a signal, for bias of active devices in amplifiers, and for measurement of voltages.  A Wheatstone bridge and a multimeter both include voltage dividers.  The voltage divider is used in potentiometers. The best examples for the potentiometers are the volume tuning knob attached to our music systems and radio transistors. When someone changes the knob on the potentiometer then the voltage will be appeared across the stable contacts and wiping contact according to the voltage divider rule.  Voltage dividers can be used to measure the resistance of the sensor. To form a voltage divider, the sensor is connected in series with a known resistance, and known voltage is applied across the divider. The analog to digital converter of the microcontroller is connected to the center tap of the divider so that tap voltage can be measured. By using the known resistance, measured voltage sensor resistance can be calculated.  It is used in the case of extremely fewer frequencies and DC  Capacitive voltage divider used in power transmission for compensating load capacitance & high voltage measurement.   * Explain working of Battery Level Indicator implemented in this experiment in your own words?   ⁻ Connect battery to the input of the circuit.  ⁻ Adjust the voltage with the help of pot to just start the Led 1.  ⁻ Keep increasing the voltage and successively each Led will start glowing. |

|  |
| --- |
| **Conclusion:** |
| Voltage division concept, current division concept and principle of operation of Led was understood. By using these concepts a Battery level indicator was made successfully. |

|  |
| --- |
| **Signature of faculty in-charge with Date:** |