**Slip 3: Write a program to detects the vibration of an object with sensor using Arduino**.

To detect vibration using an Arduino in Proteus, you can use a vibration sensor  module (such as a SW-420 vibration sensor) or a piezo sensor. In this example,  we’ll assume you have a basic vibration sensor like the SW-420, which outputs a  digital signal when vibration is detected.

**Hardware Setup in Proteus**

1. Add Components to Proteus:

 - Arduino UNO: The main controller.

 - SW-420 Vibration Sensor Module (or an equivalent): Detects vibrations and  outputs a digital signal.

 - LED (optional): To indicate when a vibration is detected.

 - Virtual Terminal (optional): To display messages when vibration is detected. 2. Wiring Connections:

 - Connect the VCC of the vibration sensor to the 5V pin on the Arduino.  - Connect the GND of the vibration sensor to the GND pin on the Arduino.  - Connect the OUT pin of the vibration sensor to Digital Pin 2 on the Arduino.

 - Connect the LED anode to Digital Pin 13 on the Arduino and the cathode to  GND through a 220-ohm resistor (optional for visual indication).

 - Optionally, add a Virtual Terminal to TX on the Arduino for debugging  messages.

**Arduino Code**

Here’s an Arduino code to read the vibration sensor output. The program will turn  on the LED when a vibration is detected and output a message on the Serial  Monitor or Virtual Terminal.

#define VIBRATION\_SENSOR\_PIN 2 // Digital pin connected to the vibration  sensor

#define LED\_PIN 13 // Digital pin connected to the LED

void setup() {

 pinMode(VIBRATION\_SENSOR\_PIN, INPUT); // Set the vibration sensor pin as  input

 pinMode(LED\_PIN, OUTPUT); // Set the LED pin as output  Serial.begin(9600); // Initialize serial communication at 9600 bps  Serial.println("Vibration Detection Initialized...");

}

void loop() {

 int vibrationState = digitalRead(VIBRATION\_SENSOR\_PIN); // Read the vibration  sensor state

 if (vibrationState == HIGH) { // If vibration is detected

 digitalWrite(LED\_PIN, HIGH); // Turn on the LED

 Serial.println("Vibration detected!"); // Print message to Serial Monitor  } else {

 digitalWrite(LED\_PIN, LOW); // Turn off the LED

 }

 delay(100); // Small delay to stabilize readings

}

**Code Explanation**

1. `digitalRead(VIBRATION\_SENSOR\_PIN)`:

 - Reads the digital output from the vibration sensor. If vibration is detected, the  sensor outputs `HIGH`; otherwise, it outputs `LOW`.

2. `digitalWrite(LED\_PIN, HIGH/LOW)`:

 - Turns on the LED when vibration is detected and turns it off when no vibration  is detected.

3. `Serial.println("Vibration detected!")`:

 - Sends a message to the Serial Monitor (or Virtual Terminal in Proteus)  whenever vibration is detected.

4. `delay(100);`:

 - Adds a small delay to stabilize readings.

**Simulation Steps in Proteus**

**1. Compile the Code in Arduino IDE:**

- Open the Arduino IDE, paste the code, and select the Arduino UNO board from  Tools > Board.

 - Compile the code, and the Arduino IDE will generate a `.hex` file in the  temporary folder. You can find this path by enabling Show verbose output during:  compilation in File > Preferences.

**2. Load the `.hex` File into Proteus:**

- Open your Proteus project.

 - Double-click the Arduino UNO module to open its properties.  - Load the compiled `.hex` file from the Arduino IDE into the Program File field.  - Click OK to save the changes.

**3. Run the Simulation:**

- Start the simulation in Proteus.

 - If the vibration sensor module detects a vibration (you may need to trigger it  manually in Proteus or adjust its parameters), the LED on pin 13 should light up.

 - Check the Virtual Terminal or Serial Monitor for messages indicating that  vibration was detected.

**Notes**

1. Simulation Limitation: In Proteus, actual physical vibration can't be simulated,  but you may be able to set the vibration sensor to manually trigger a `HIGH`  output to test the code.

2. Physical Hardware Testing: For real-world testing, this code should be uploaded  to an actual Arduino with a connected SW-420 vibration sensor.