PRACTICE 9: MODERN IoT

1. Connect a Streetlight Device to **ThingsBoard**

Register a streetlight device and send telemetry (e.g., brightness, status).
Steps:

a) Create a new **Device** on ThingsBoard (e.g., “Streetlight-001”)
b) Generate the **access token**
c) On your device (e.g., ESP32):
   - Read LDR sensor data for ambient light
   - If brightness < threshold, consider it “night”
d) Send telemetry to ThingsBoard via
   i) **MQTT**
   ii) **HTTP**

```
{
  "ambient_light": 150,
  "status": "ON"
}
```

e) Visualize data on a dashboard

2. Remote Control of a Streetlight

Turn the light ON/OFF remotely using a ThingsBoard **dashboard switch.**
Steps:

a) Create a **switch control** widget on your dashboard
b) On your device, subscribe to the **RPC** topic
c) When a command is received (e.g., `{"method":"setStatus","params":"ON"}`), control the streetlight relay/LED. If params is OFF then turn off the light
d) Report the new status back

3. Smart Streetlight with Auto and Manual Modes

Combine sensor automation with manual override to control in cases:

- If in **auto mode**, control streetlight based on light sensor
- If in **manual mode**, control via dashboard switch

4. Streetlight Monitoring Dashboard

Building a **real-time visualization** for smart streetlights using **ThingsBoard** dashboards. Implement on two devices:

a) ESP32
b) Raspberry Pi

Create an interactive **dashboard** on ThingsBoard that displays:

- Ambient brightness (from sensor)
- Light ON/OFF status
- Device uptime
- Mode (Auto/Manual)
- Event counters (e.g., how many times light turned ON)
- Device type

Telemetry (data sent periodically):

- `ambient_light` (Integer): Light level from LDR (0-1023)
- `status` (String): `"ON"` or `"OFF"` based on whether the light is currently lit
- `uptime` (Integer): Seconds or milliseconds since the device started
- `mode` (String): `"AUTO"` or `"MANUAL"`
- `on_count` (Integer): Number of times the light has been turned on

Attributes (optional static data):

- `location`: Device physical location
- `model`: Device model or ID

Ensure your device is sending telemetry like this:

```
{
  "ambient_light": 120,
  "status": "ON",
  "uptime": 45600,
  "mode": "AUTO",
  "on_count": 5,
 “model”: “DHT20”
}
```

Document Your Experimentations:

Your lab report **must include:**

- High-level description of your experiment.
- Step-by-step description so a classmate could repeat it.
- Data from your experiment.
- Answers to the lab questions.
- Interpretation of your results.