1. **Scenario:** You are designing an IoT-based smart home system that includes the following devices: Smart lights (10 devices), Smart thermostat (1 device), Smart security cameras (5 devices) and Smart door locks (3 devices). [2 pts]

   Task: Choose the most appropriate network architecture from the following options and justify your choice:

   a) Peer-to-Peer Network
   b) Star Network
   c) Hierarchical Network

   Compare the chosen architecture with the other two options, highlighting why they are less suitable for this application.

2. **Scenario:** You are in charge of a team of **10 drones** that will capture video and photos of a wedding happening in a **15-acre area**. Your goal is to design a system that ensures the drones work together effectively to capture all the important moments of the event. [3 pts]

   Question: What **questions** or **requirements** (at least five) would you ask or consider while designing such a system? **Note:** You don't need to have all the technical answers. Focus on identifying the key questions and requirements that would guide the design process.

3. **Scenario:** You are designing an IoT device to monitor soil moisture in an agricultural field. The device is battery-powered and needs to operate for several months without requiring frequent battery replacements. The device measures soil moisture every 10 minutes and transmits the data to a central server for analysis. [3 pts]

   Questions:

   1. **Battery Life Extension Techniques:** What techniques can you apply to extend the battery life of the IoT device?
   2. **Limitations of the Techniques:** Describe an **application or scenario** where the techniques you proposed might **not work well**.

4. **Claim:** The SRAM size on an ESP32 device is 520 KB. Therefore, the maximum size of a program that can run is bounded by 520 KB. Argue **for or against** this claim with clear explanation and including relevant information. [1½ pts]

5. **Question:** The ESP32 is a popular chip used in many IoT and embedded systems projects. Based on its features and architecture, answer the following: [2 pts]

   1. Is the ESP32 a **microcontroller** or a **microprocessor**? Justify your answer.
   2. Explain the key differences between a microcontroller and a microprocessor.

6. **Question:** Can we use native compilation for developing IoT applications on ESP32? Make a clear argument for your claim. [2 pts]

7. Can ESP32 run multi-threaded programs? If yes, how? If no, why? [1½ pts]