Q1. What is the most suitable sensor to measure the water level in water bodies for the following situations? List advantages and disadvantages of this sensor.

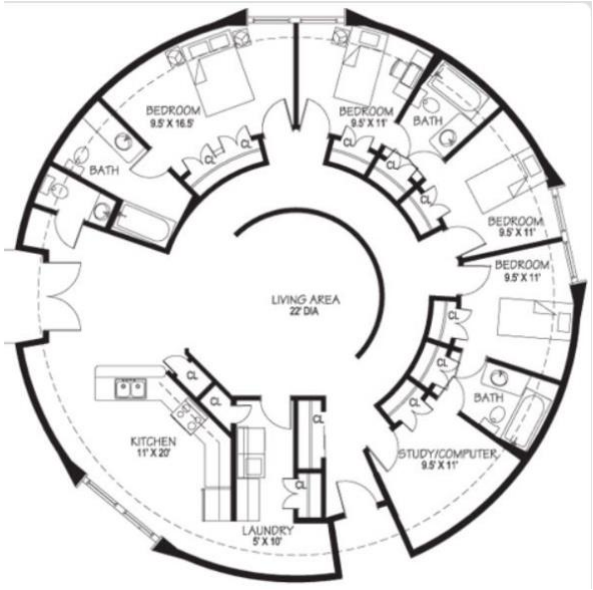
(a) In water bodies at high altitudes with heavy wind.
(b) In lakes where freezing temperature of water is reached.
(c) In water bodies with debris, pollutants, garbage.
(d) In rivers like Yamuna with critical level of chemicals and pollutants.

Q2. Difference between Polling and Interrupts. Give benefits and limitations of both. Small numerical about calculating power consumption of a program in each case (given delay, function run time, and power consumption for run time and sleep mode)

Q3. What is OTA?

(a) Suppose you are sending an update via OTA and your network connection is interrupted in between. What will happen? (Hint: Explain the process of sending update via OTA)
(b) How will ESP32 firmware handle this such that it remains operational and bootable. (Hint: Explain how it will revert to previous update)

Q4. You are tasked with designing the Heat, Ventilation and Air Conditioning of this house. You have a PIR sensor as a proximity sensor to detect the presence of a person in any room.



(a) What will you do for –
- Sensor Sensitivity and Tuning
- Optimal Placements of the sensors
- Reduce false positives
- Minimizing the number of sensors

(b) How is PIR sensor compared to any other proximity sensor like Ultrasonic Sensor? Give benefits and limitations of PIR sensor.

Q5. 5 MCQs

Q6.

(a) Plot a graph for Bandwidth vs Communication Range for the following
    1. NFC 2. Bluetooth 3. LoRa 4. Wi-Fi 5. Zigbee 6. 4G/5G
(b) Arrange them in ascending order of Power Consumption.

Q7. You are to put GPS and Accelerometer sensors on animals in a forest area. Which will provide basic data about the location and walking/sitting state of the animal. The cellular connection in the area is poor. The central station where the data is needed is not very far from the forest. What do you suggest doing for the following.

(a) What communication technology will you use to send the data?
(b) What technical challenges will you face and how will you resolve them?
(c) [something about centralized vs multi-source data collection]
(d) [something like How will you process and use the data?]