① Describe any 5 Characteristics of IOT.

→ ① Connectivity:-

Connectivity is an important requirement of IOT infrastructure. Things of IOT should be connected to the IOT infrastructure. Anywhere, anyone, anytime can connect, this should be guaranteed at all times.

② Intelligence and Identity:-

The extraction of knowledge from the generated data is very important. For example, a sensor generates data, but that data will only be useful if it is interpreted properly. This identification is helpful in tracking the equipment and at times for querying its status.

③ Scalability:-

The number of elements connected to the IOT zone is increasing day by day. Hence, an IOT setup should be capable of handling the massive expansion. The data generated as an outcome is enormous, and it should be handled appropriately.

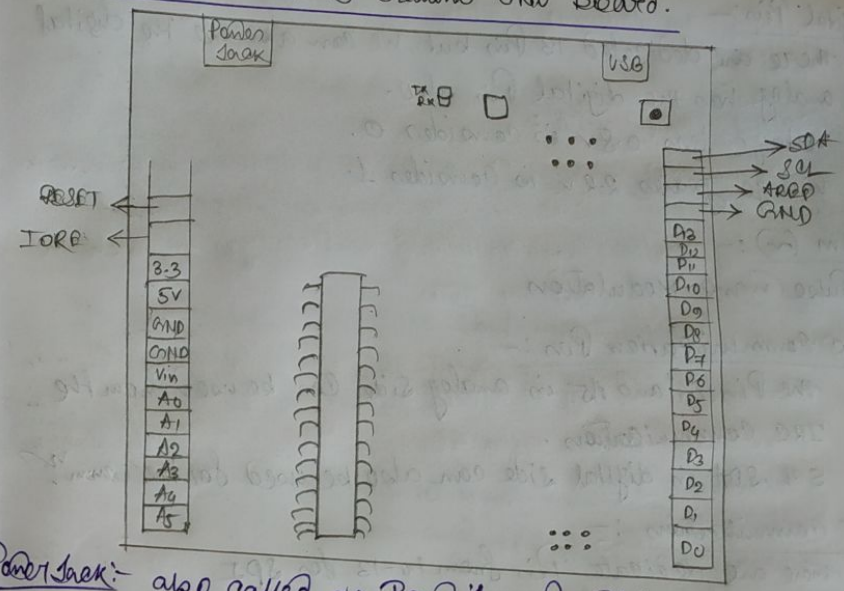
④ Dynamic & Self adapting:

IOT devices should be dynamically adapt themselves to the changing contexts and scenarios.
Assume a camera meant for the surveillance. It should be adaptable to work in different conditions and different light situations (morning, afternoon, night).

⑤ Safety:-

There is a danger of the sensitive personal details of the users getting compromised when all devices are connected in the internet. This can cause a loss to the user.

① (b) Illustrate the Pinout of Arduino UNO Board.



- Power Jack:- also called as Barrel Jack. In which voltage 5-12V can be supplied using the DC adapter.

- USB:-

This can accept input of 500mA and can be used for the serial communications.

- Vin Pin:-

This Pin is used to supply external voltage to the board using external power. Supply range 3.3V to 5V.

- GND:-

There 5 GND Pins 3 are in the female jack and 2 are in male jack.
2 are in analog side & 1 is in digital side.

- Analog Pin:-

There are 6 Pins for analog communication, they can perform analog Read through ADC (analog digital converter). It converts the signal from 0 to 1023. A0-A5.

Digital Pins:-

There are dedicated 13 Pins but We can also use the digital analog has the digital Pin also.

voltage less 0.8v is consider 0.

voltage greater 2.2v is consider 1.

Pwm (~):-

Pulse Wave Modulation

I2C Communication Pins:-

The Pin A4 and A5 in analog side can be used from the I2C communication.

SCL, SDA in digital side can also be used for the comm.

SPI Communication:-

There are dedicate Pins from 10-13 for SPI.

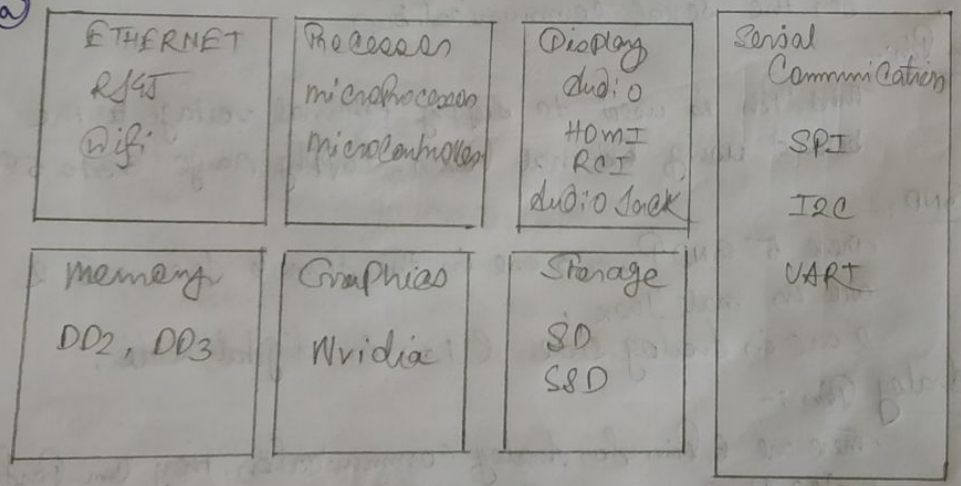
UART Communication:

Tx → UART IN

Rx → UART OUT.

(2)

(a)



Communication (Serial)-

SPI, I2C, UART

Any Generic IOT device should support the communication of serial device is very important. It can support SPI, I2C or UART. But it need support Serial communication so data transfer take care.

Display and Audio:-

The IOT need Provide the Port that help to visualize the Process and view the Input & output through the device. it may Audio or vedio.

Storage:-

Every IOT device need to have minimum storage for the runing of Program and storing of the Program

Processor:-

This for the local computation of data received from the sensor, remote sensors, are for the communicate with device for any logical operation.

Graphics:-

If the device required the high identity GPU Power then graphics is required.

Ethernet:-

Connect the device through Internet we need RJ45 or Wifi which are basically Provided any IOT device.

memory:-

Primary memory faster execution of the Program in the IOT device.

(2)

(b) Construct an Arduino Sketch to monitor temparature and humidity.

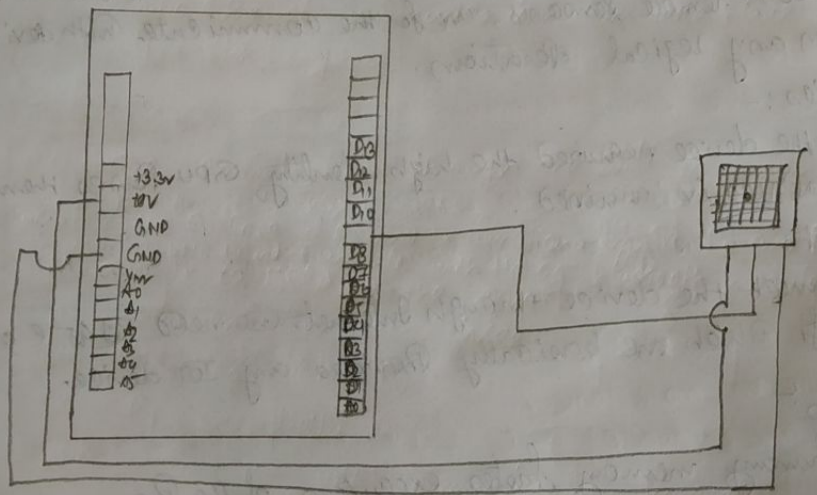
→ Required Components :-

- → Arduino Board ×1
- → DHT 11 ×1
- → Any device (Computer, Laptop) Raspberry Pi to flash the code any view the data.

DHT 11

manufactured by Adafruit.
Give temparature 0 to 50.
Accuracy ± 1
humidity 0.5
Accuracy

Fritzing Diagram ↓



Code ↓

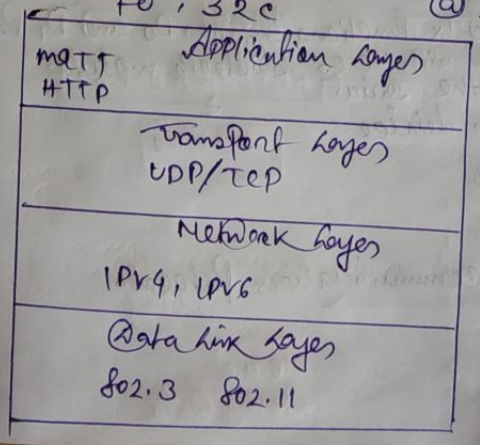
```
include <dht.h>
dht DHT(9, DHT11)
void setup()
{
  Serial.begin(9600);
  // for Serial communication and baud rate 9600.
  Serial.println("humidity & temparature");
}
void loop()
{
  Serial.print("DHT.readhumidity());
  // to read humidity
  Serial.print(" ");
  Serial.print(DHT.readtemparature());
  Serial.print("C");
  Serial.println();
}
```

Output ↓

On Serial Monitor: ↓

humidity & temparature
86 , 26C
75 , 30C
70 , 32C

(3)(a)



(3)(a) List any 4 layers of IoT with Protocols with an illustration.

- Application Layer:-

Through application layer all the communication with the other application take Place.

- HTTP ↓

In HTTP it sends a request to a server. Server send the response to the intermidate network through which communication take Place.

- MQTT ↓

Publisher - Subscribes -

Here the Publisher Publish the data to the ~~Protocol~~ broker. The broker is assigned with the client and Publisher through that broker sends the subscribed data to the subscribes.

- Data link layer:-

- 802.3 ↓

This ethernet communication can take Place in the data link layer.

- 802.11 ↓

The communication through the wifi is taken Place in the data link layer.

(a) What is the Purpose of Rx and Tx functionality for D0 and D1 Pin in arduino UNO Board - Elaborate with HC-05 bluetooth module

(b) RX and Tx is used for the serial communication with other device

Rx → D0 or digital D0

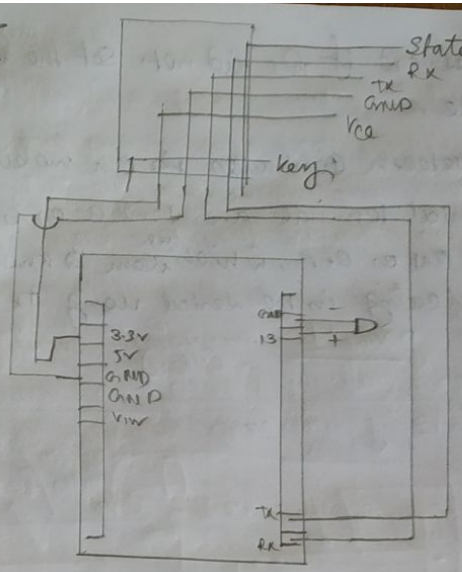
Tx → D1 or digital D1

Help we use the UART communication Protocol.

UART IN = Tx

UART OUT = Rx.

HC05



Code ↓

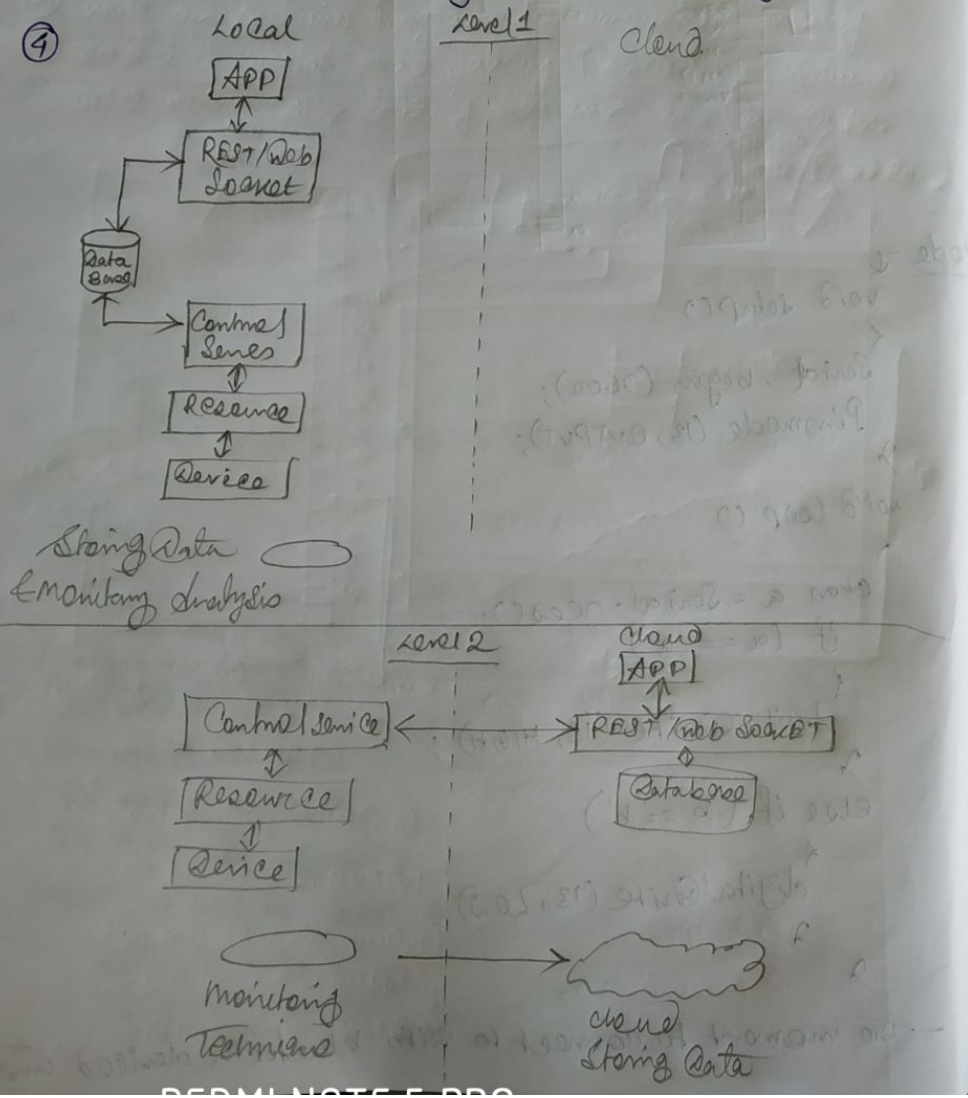
```
void setup()
{
Serial.begin(9600);
Pinmode(13, OUTPUT);
}
void loop()
{
char a = Serial.read();
if (a == 'a')
{
digitalWrite(13, HIGH);
}
else if (b == 'b')
{
digitalWrite(13, LOW)
}
}
```

- the moment to connect ~~to~~ with bluetooth device and

Enter the default Password if we did not set the Password (1234 or 000) in mobile.

- In the Arduino Bluetooth connected in our mobile device.
- Then select the serial terminal and send a or b through COD turn ON or OFF, which we can know that device is communicating in the serial using TX and RX.

④



- Application ↓

This Provide the user interface to the user or end user through which we can communicate to the server.

- RSST/Web Sockets ↓

It Provides the application and control services and communicate with them through the Webserver and HTTP Request.

- Database ↓

This is used to store the data in the organized way.

- Control Service ↓

This is a communication link between the Webserver and the local node through which data can send or received.

- Resource ↓

All the communication with sensor, Actuator, monitoring and analysis are all with the resource section.

- Device ↓

it is the things in IoT which have an unique identity and Perform the task like Actuig sensing.

→ Level 1 ↓

All the Process and data in the local from the Webserver to the communication the user all are present in the local through which all the task are Performed.

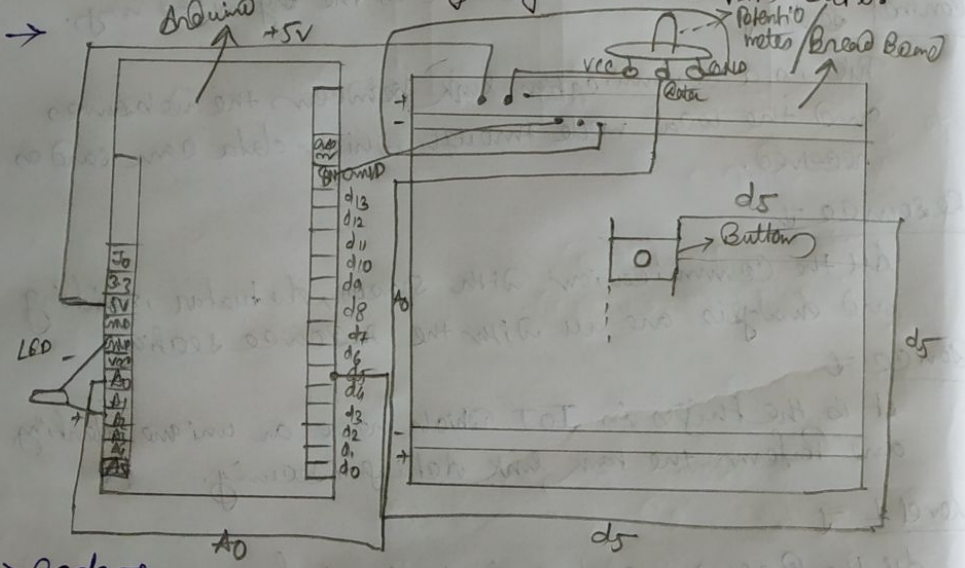
- Device send data resource and resource send the data to the Control Service to Rest API and form that APP.

Level 2 ↓

But in Level 2 the data storing and application deployed in the cloud that makes any one which the Internet access can work with the IoT deployment. that is feature that has been enhanced.

⑤ Write an Arduino Program to demonstrate analog read and digital read facility Provided by Arduino UNO board with fritzing diagram and Pin outs.

→



→ Code ↓

```
void Setup()
{
Serial.begin(9600);
Pin mode (13, OUTPUT);
Pin mode (A0, INPUT);
Pin mode (5, OUTPUT);
Pin mode (A2, OUTPUT)
```

```
int a, b;
void loop
{
  delay(500);
  a = analogRead ( );
  b = digitalRead ( );
  analog Write (a/2);
  Serial.Print ("volume is level");
  Serial.Print (a);
  if (b == 1)
  {
  Serial.Println ("Button clicked")
  digitalWrite (13, High)
  Delay (500);
  digitalWrite (13, Low);
  }
}
```

Output ↓

Serial monitor

If we Increase the Knob then

the volume is 506
the volume is 559
the volume is 593.

The Button Pressed.

Analog Read :

Read the value from 0 to 1023 from the Board. which have a ADC (Analog Digital Converter) which converts the signal to digital.

Digital Read :

voltage less than 0.8v is considers zero. voltage graater than 2.2 is considers one.