Internet of Things

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1CR17CS144 'B-C'

IAT-3

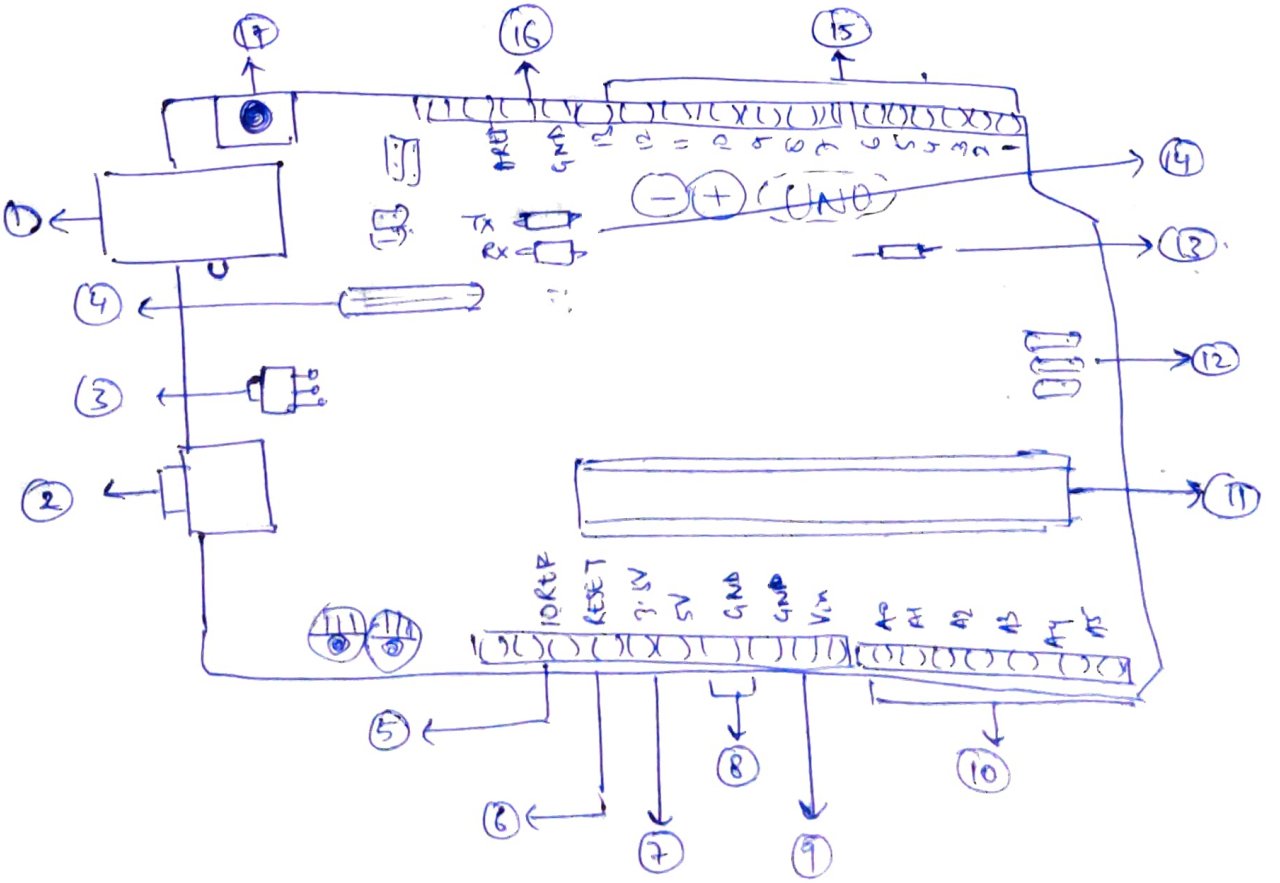
Q4) write a neat diagram explain Arduino UNO and Raspberry Pi.

→ Arduino UNO

→ It is an open-source platform which consists of both hardware and software..

→ It contains a circuit board which is known as microcontroller and a ready-made software called as Arduino IDE (Integrated Development Environment)

→ It can be easily programmed and connected to the system without the need of any sophisticated tools.



(1) Power USB: Arduino board can be powered by using USB cable from the USB port in computer.

(2) Power (Barrel Jack): Arduino board can also be powered directly from AC mains power supply by connecting to the Barrel Jack.

(3) Voltage Regulator: It controls the voltage provided to the Arduino board and stablizes DC voltage.

(4) Crystalt Oscillator: It is used to calculate time in Arduino. The number printed on Arduino board is 16000000 Hz or 16MHz.

(5),(17) Arduino Reset: Pin 5, 17 can be used to reset the board, i.e to start the program from beginning
Pin 17 is the reset button.
Pin 5 is an external connection.

(6),(7) Pins: (3.5, 5V, GND, Vin). Pin 6 - 9.

(5),(9) 3.3V (6) - It supply 3.3 output voltage.
5V (7) - It supply 5 output voltage
GND (8) - Used to connect the circuit to ground.
Vin (9) - This pin can be used to power Arduino from external source.

(10) Analog pins - It has 6 analog pins (A0 - A5)

(8)(11) Main microcontroller - Each arduino board has its own microcontroller. It acts as the brain of Arduino.

(12) ICSP pin - It is a tiny programming header for Arduino.

(13) Power LED Indicator - This LED lights up if Arduino is powered by the supply.

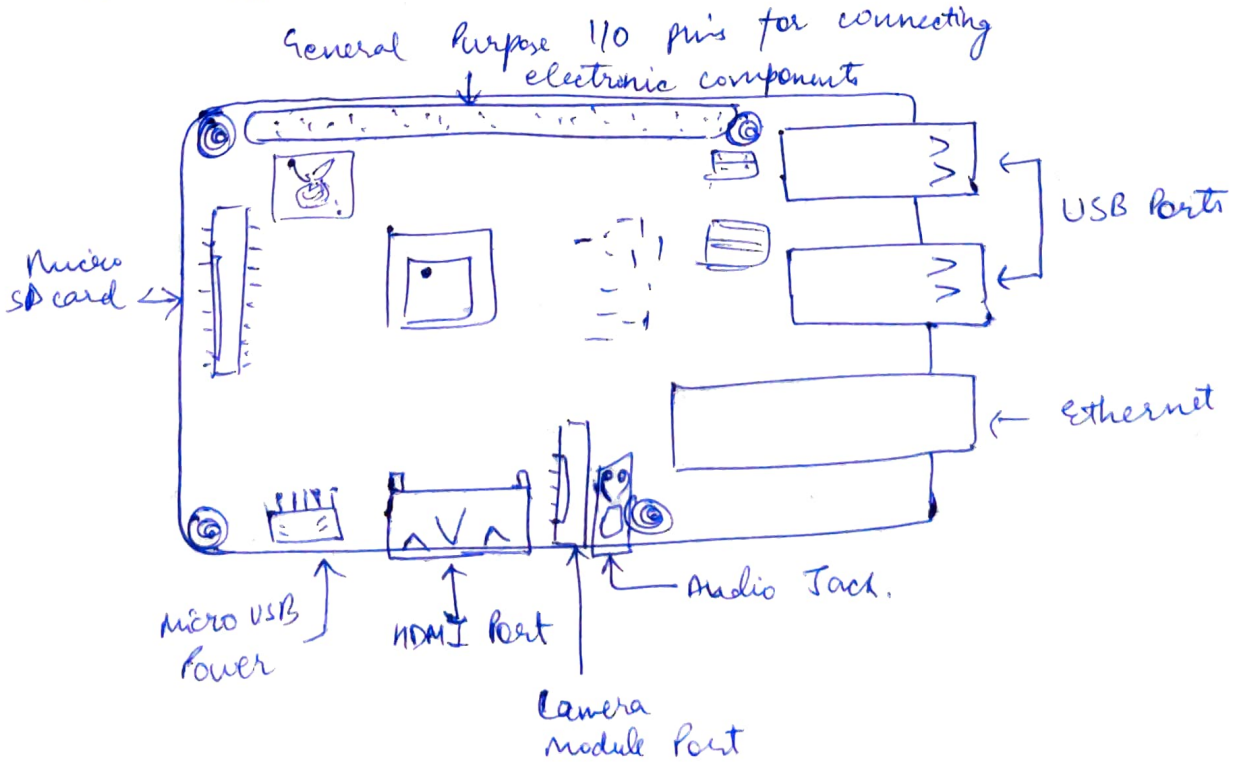
(14) TX and RX pins (LED) - They are used for transmission and receive.

(15) Digital I/O - The arduino board has 14 digital I/O pins, out of which 6 provides PWM (Pulse-Width modulation).

(16) AREF - Stands for Analog Reference. Used to set an external reference voltage (0-5)V.

Raspberry Pi

⇒ It is a single board computer. Any number of peripherals can be connected to Raspberry Pi. It is mainly used for real-time Image / Video processing, IOT Applications and Robotics.



Components:

① USB Port is used to connect a wide variety of components

② HDMI port is used to output audio and video to a monitor.

③ Audio Jack: It allows to connect headphones and speakers.

④ Micro USB: The micro USB board is only for power.

⑤ GPIO: This port allows Raspberry Pi to take I/P and output from any electronic board.

⑥ SD card slot: The Raspberry Pi uses SD card to store extra information and data.

⑦ The serial Interface on Raspberry Pi has Recive and Transmit (RX & TX) pins for communication with serial peripherals.

⑧ The I2C pins allows to connect hardware modules.

Q5, Wireless Temperature Monitoring System:

→ There are a wide range of applications for IOT. Temperature Monitoring System is one of them.

→ The Wireless Temperature Monitoring System uses gas sensors, temperature sensors, Mems, piezoelectric sensors values to read the value and monitoring using Thingspeak system via Raspberry Pi

→ ThingSpeak is an application platform for the IoT.

→ It allows to build an application with the data collected by the sensors.

→ There is a ThingSpeak channel, where the data can be sent and stored.

→ Each channel includes 8 fields for any type of data.
3 location fields
1 status field.

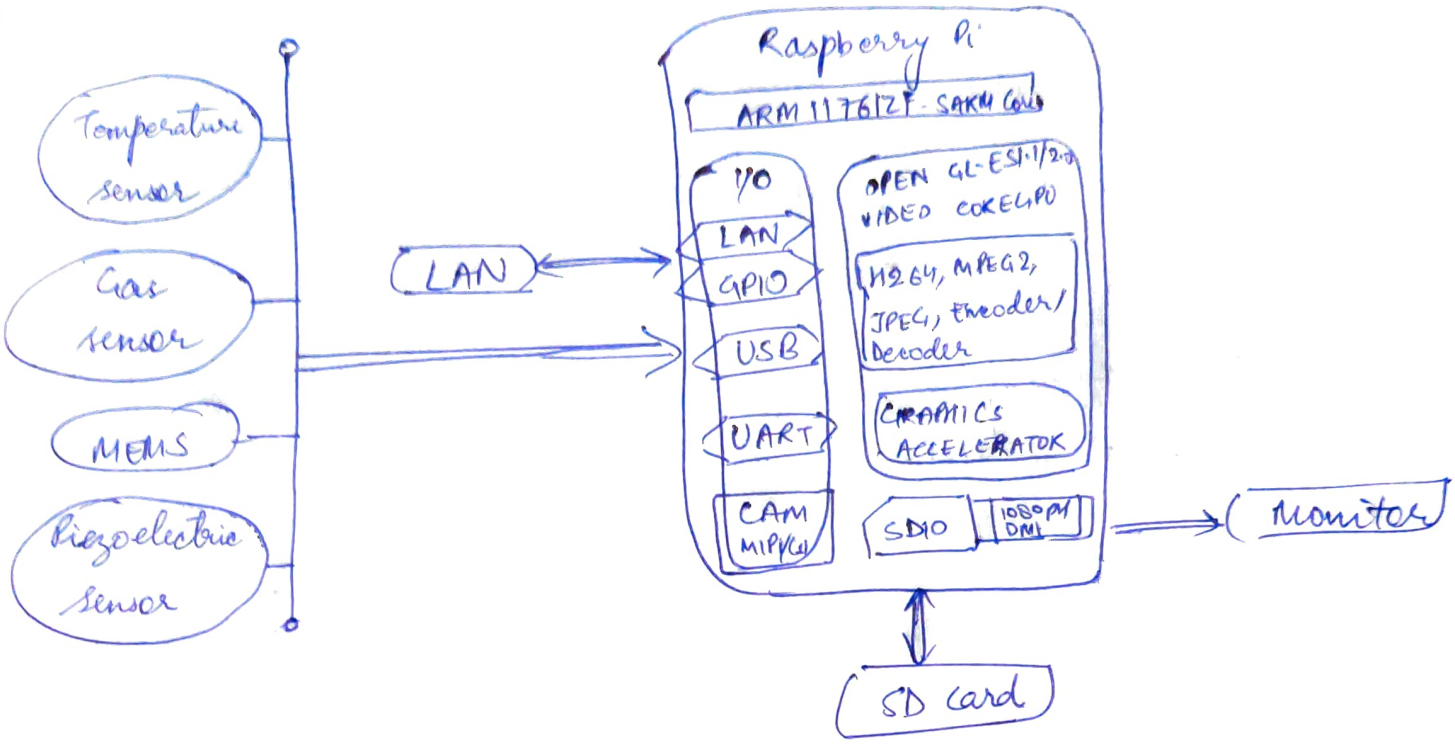
→ Once the data is published by ThingSpeak channel, it processes the data and then the application retrieves the data.

→ In the existing system, the temperature is manually monitored. By using GSM technology. CCTV camera monitoring can also be used but it cannot sense gas, temperature and position of valves.

→ In the proposed system, however, Internet of Things is used. It consumes time and monitors the exact situation at a much faster pace.

→ Hardware used:
Raspberry Pi, Temperature Sensor, Gas Sensor, Mems Sensor, Piezoelectric sensor.

→ Software:
OS, Python language.



Advantages:-

① Decreased field damaging conditions.
② Improved safety and security.
③ High speed data rate.

Applications:- Industry monitoring and Home Automation.

Q2) Advantages of Internet Protocol:

① open and Standards-based:

The IOT creates a new paradigm in which devices, and functionalities and applications and users can leverage a large set of devices and functionalities while guarenteeing interchangeability and interoperability, security and management.

② Versatile: A large spectrum of access technologies is available to offer connectivity of "things". Additional protocols and technologies are also used to transport IOT data.

③ Ubiquitous: All recent OS releases, form general-purpose computers and servers to lightweight embedded s/y, have an integrated dual (IPv4, IPv6) stack that get it enhanced over time.

④ Scalable: IP has been massively deployed and tested for robust scalability. Millions of private and public IP infrastructure nodes have been operational for years, offering strong foundations.

17
27.

⑤ Manageable & Highly secure: Communication infrastructure requires appropriate management and security capabilities for proper operation.

⑥ Scalable and resilient: IP has a large and well-established knowledge base and most importantly, it has been used for years in critical infrastructure.

⑦ Consumer's market adoption: When developing IOT solutions and products targeting the consumer market, vendors know that consumer's access to applications and devices will occur predominantly over mobile wireless.

⑧ The Innovation factor: Adoption of IP as a factor for increased innovation. IP is a standards-based protocol that is ubiquitous, scalable, versatile and stable.

Q7).

Program to blink an LED.

① Arduino UNO.

```
import serial
import time          # for delay functions
arduino = serial.Serial('com4', 9600)
time.sleep(2)

print arduino.readline() # read the data
print ("Enter 1 for LED ON and 0 to LED OFF")
# for user to control the blinking
while 1:
    var = raw_input()
    if (var == '1'):    # get input from user.
        arduino.write('1')
        print("LED turned ON")
        time.sleep(1)
    if (var == '0')  # if value is 0, send 0.
        arduino.write('0')
        print ("LED turned OFF")
        time.sleep(1).

# automatic blinking
for i in range(10):
    serial.writelines(b'H')    # send a byte
    time.sleep(0.5)            # wait
    serial.writelines(b'L')    # send a byte
    time.sleep(0.5)

serial.close()
```

② Raspberry Pi

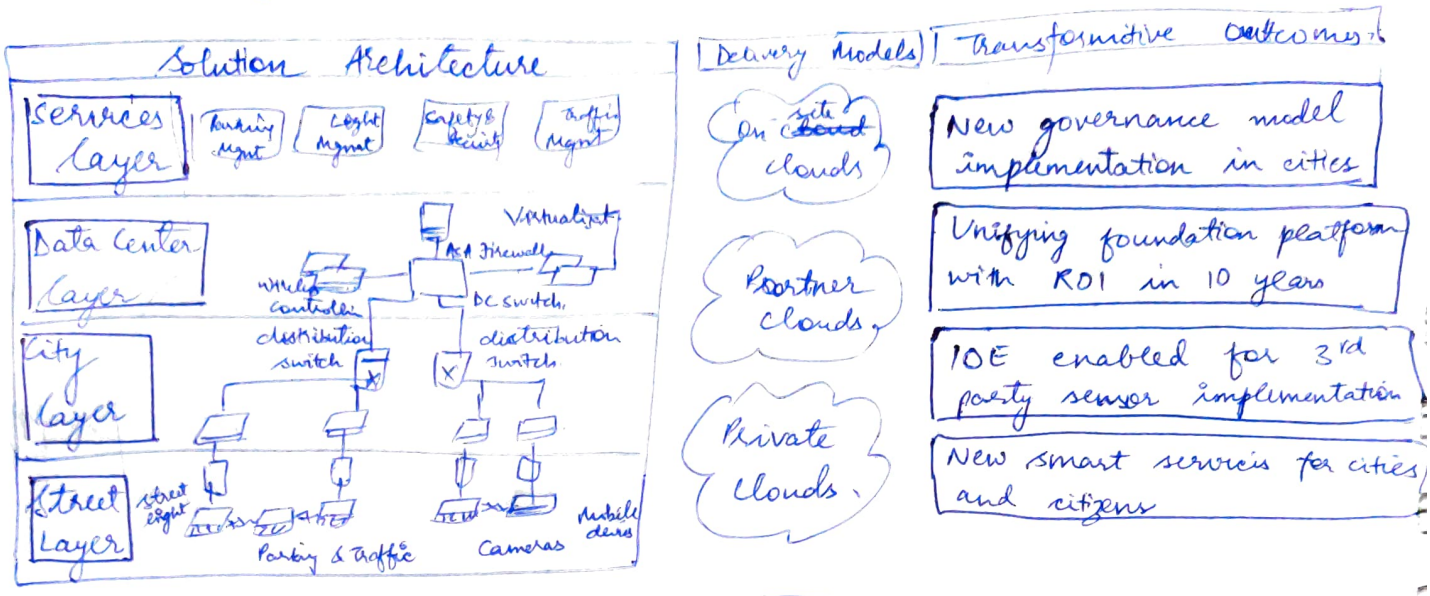
ⓐ File: blink.py.

```
import RPi.GPIO as GPIO.
GPIO.setmode(GPIO.BCM)
GPIO.setup(17, GPIO.OUT)    # configue Pin 17 as output
GPIO.setup(27, GPIO.OUT)    # configure Pin 27 as output.
GPIO.output(17, GPIO.HIGH)  # turn up LEDs on PIN 17
GPIO.output(27, GPIO.HIGH)  # turn up LED's on PIN 27.
time.sleep(1)               # wait

GPIO.output(17, GPIO.LOW)   # turn off LEDs on Pin 17
GPIO.output(27, GPIO.LOW)   # turn off LEDs on Pin 27.
turn.sleep(1).
```

ⓑ File: blink.every.py

```
import time.
import RiGPIO.as GPIO.
GPIO.setmode(GPIO.BCM)
GPIO.setup(17, GPIO.OUT)    # configure Pin 17 and 27 as
GPIO.setup(27, GPIO.OUT)      output pins.

while 1:
    GPIO.output(17, GPIO.HIGH)  # Turn the LEDs ON
    GPIO.output(27, GPIO.HIGH)
    time.sleep(1)
    GPIO.output(17, GPIO.LOW)   # Turn the LEDs OFF.
    GPIO.output(27, GPIO.LOW)
    time.sleep(1).
```

5. Smart City IOT Architecture



→ Smart City IOT infrastructure is four-layered architecture :

① Street Layer : It is composed of devices and sensors that collect data and take actions based on instructions. Eg :- Video Cameras can detect vehicles, faces and traffic conditions for various traffic and security purposes.

② City Layer : It is mainly used to connect Layer 1 with Layer 3. It comprises of network routers and switches. This layer aggregates all data collected by sensors and the end-node n/w into a single transport network.

- Data center Layer - Data is collected from the sensors and sent to a data center for processing. Based on processing, meaningful data is derived and information is provided. Eg:- An application in data center can provide a global view of the city traffic and help the authorities decide on the need of vehicles.

- Services Layer - The true value of ICT connectivity comes from the services that are measured. The collected data should be visualized according to the specific needs of each consumer of that data. Eg:- Parking data indicates which sports aren't currently occupied.