IoT (Internet of Things)

- Syllabus
    - Networking
        - Basic Networking concepts
        - Types of Network - (wired and Wireless)
        - ISO OSI model
        - TCP/IP model
        - IP addressing
        - Network Infrastructure (cables, switches, routers)
    - IoT Networks
    - Personal Area Networks (Zigbee, Bluetooth)
    - 5G Technology
    - Communication Protocols : REST(HTTP), CoAP, MQTT
    - Embedded AI
- Practicals
    - Python
    - mysql
    - NodeMCU (ESP8266)
- Evaluations
    - Internal - 20 Marks
    - Lab Exam - 40 Marks
    - Theory Exam - 40 Marks

What is IoT?

- The term IoT introduced by Kevin Ashton in 1997 with his work at Proctor and Gamble using RFID ags to manage supply chains.
- IoT (Internet of Things) is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service.
- These systems allow greater transparency, control, and performance when applied to any industry or system
- IoT systems have applications across industries through their unique flexibility and ability to be suitable in any environment
- They enhance data collection, automation, operations and much more through smart devices and powerful enabling technology

M2M

- General concept involving an autonomous device communicating directly to another autonomous device

- Autonomous refers to the ability of the node to instantiate and communicate information with another node without human intervention
- The form of communication is left open to the application
- It may very well be the case that an M2M device uses no inherent services or topologies for communication

IoT

- IoT systems may incorporate some M2M nodes (such as a Bluetooth mesh using non-IP communication), but aggregates data at an edge router or gateway
- An edge appliance like a gateway or router serves as the entry point onto the internet
- Alternatively, some sensors with more substantial computing power can push the internet networking layers onto the sensor itself

Features

- Artificial Intelligence
  - IoT essentially makes virtually anything “smart”
  - it enhances every aspect of life with the power of data collection artificial intelligence algorithms
- networks
  - Connectivity
  - Networks can exist on a much smaller and cheaper scale while still being practical
  - IoT creates these small networks between its system devices
- Sensors
  - IoT without sensor can not do anything
  - They act as defining instruments which transform IoT from a standard passive network of devices into an active system capable of real-world integration
- Devices
  - IoT exploits purpose-built small devices to deliver its precision, scalability, and versatility

Advantages

- Improved Customer Engagement
  - Current analytics suffer from blind-spots and significant flaws in accuracy; and as noted, engagement remains passive
  - IoT completely transforms this to achieve richer and more effective engagement with audiences
- Technology Optimization
  - The same technologies and data which improve the customer experience also improve device use, and aid in more potent improvements to technology
- Reduced Waste
  - IoT makes areas of improvement clear
  - IoT provides real-world information leading to more effective management of resources
- Enhanced Data Collection
  - IoT makes data collection easier
  - With the collected data we can accurately analyse the world we want
  - It allows an accurate picture of everything

Disadvantages

- Security
  - IoT creates an ecosystem of constantly connected devices communicating over networks
  - The system offers little control despite any security measures
  - This leaves users exposed to various kinds of attackers
- Privacy
  - The sophistication of IoT provides substantial personal data in extreme detail without the user's active participation
- Complexity
  - Some find IoT systems complicated in terms of design, deployment, and maintenance
- Flexibility
  - Many are concerned about the flexibility of an IoT system to integrate easily with another
  - They worry about finding themselves with several conflicting or locked systems
- Compliance
  - Its complexity makes the issue of compliance seem incredibly challenging

IoT Components

- Sensors
- Hardware
- Connectivity
- Data Processing
- Applications

Database

- collection of tables
- Table has rows and columns
- Column indicates information
- Row indicates one record

mysql

- to install database
  - sudo apt-get install mysql-server
- to open mysql command promt
  - sudo mysql -u root -p
- to install python mysql connector
  - sudo pip3 install mysql-connector-python
- to check status of mysql serive
  - sudo systemctl status mysql.service
- to start mysql service

    - sudo systemctl start mysql.service
- to stop mysql service
    - sudo systemctl stop mysql.service

mysql queries

- To list all the databases

```
    show databases;
```

- To create new database

```
    create database iot_sept23;
```

- To change the database

```
    use iot_sept23;
```

- To list all tables

```
    show tables;
```

- To create new table

```
    create table students(rollno int, name varchar(20), std int, marks
float);
```

- To see description of table

```
    desc students;
```

- To insert data into table

```
    insert into students values(80123, "abc", 5, 95.5);
    insert into students(name, rollno, std, marks) values("pqr", 80124, 6,
90.7);
```

- To display record of table

```
    select * from students;
    select rollno from students;
    select name from students;
    select rollno, name from students;
    select name, marks from students;
    select * from students where rollno=80124;
    select name from students where rollno=80124;
    select * from students where name="abc";
    select * from students where std=6;
```

- To delete record from table

```
    delete from students where rollno=80126;
```

- To update record

```
    update students set marks=92 where name="pqr";
```

- To create table for storing temperatures

```
    create table temperatures(temperature float, location varchar(20), time
timestamp default CURRENT_TIMESTAMP);
```

- To insert temperature into table

```
    insert into temperatures(temperature, location) values(32,
"indrayani");
```

- To get all temperatures

```
    select * from temperatures;
```