**Smart Public Toilet IoT System**

**Components Required:**

1. Public Toilet

2. IoT Sensors (motion, occupancy, water flow, etc.)

3. Microcontroller (e.g., Raspberry Pi, Arduino)

4. Internet Connectivity (Wi-Fi, cellular)

5. Mobile App or Web Interface

6. Power Supply (solar panels, batteries)

7. Central Server (cloud or local)

**Key Features:**

1. Occupancy Detection: Use motion sensors to detect if the toilet is occupied or vacant. This information can be displayed on an LED panel outside the toilet.
2. Automatic Door:lmplement a motorized door with a sensor to open and close the door when someone approaches or leaves.
3. Sanitation Monitoring: Install sensors to monitor the cleanliness and supply levels of toilet paper, soap, and hand sanitizer. When levels are low, an alert can be sent to maintenance.
4. Water Management: Use water flow sensors to regulate the flush and detect leaks. Implement a low-flow system to conserve water.
5. Environment Monitoring:Include sensors for temperature and humidity to ensure comfort inside the toilet.
6. Payment System:Implement a payment gateway for access to the toilet, or provide a free limited usage period.
7. User Feedback:Collect feedback through the mobile app or web interface for users to report issues or rate the cleanliness.
8. Security:Ensure data security and privacy by encrypting the data transmitted from sensors to the central server.

**Working**:

1. Sensors continuously monitor various aspects of the toilet and transmit data to the central server.
2. Users can access real-time information about toilet occupancy and cleanliness through the mobile app or website.
3. The system can automatically open and close the toilet door based on occupancy, improving hygiene and security.
4. Payment for usage can be integrated into the mobile app, making it convenient for users and providing revenue for maintenance.
5. Maintenance personnel receive alerts when supplies are low or when there are issues with the toilet’s functionality.

**Benefits:**

1. Improved hygiene and cleanliness.

2. Efficient resource management (water, supplies).

3. Enhanced user experience.

4. Revenue generation through paid access.

5. Data-driven maintenance for cost-saving.

6. Environmentally friendly (water conservation).

**Challenges:**

1. Initial setup and cost.

2. Maintenance of sensors and IoT infrastructure.

3. Ensuring user privacy and data security.

4. Accessibility for all users, including those without smartphones.

5. Regulatory and compliance considerations.

This project combines IoT technology with public infrastructure to create a more convenient and efficient experience for users while optimizing resource usage and maintenance efforts. It can contribute to better public health and hygiene in urban areas.