Attendance System	Advantages	Disadvantages
Manual Attendance Marking	**Simplicity**: No need for special equipment, only pen and paper or simple software. **No Technology Requirement**: Works in low-tech environments. **Customizable**: Easily adapted to various attendance policies.	**Error-prone**: High risk of human error or tampering (proxy attendance). **Inefficient**: Difficult to track and analyze for large attendance data.
Biometric Attendance Marking		
(A) Fingerprint-based	**Highly Accurate**: Unique fingerprint ensures authenticity. **Fast**: Quick scanning process.	**Hygiene Issues**: Frequent contact with devices can lead to hygiene concerns. **False Negatives**: Dirty or wet fingers can cause false rejections. **Expensive**: Requires specialized equipment for scanning and software integration. **Proxy Attendance**: Making fake fingerprint leads to false entries.
(B) Facial Recognition	**Contactless**: No physical contact required, making it hygienic. **Convenient**: Fast and automatic marking once the face is detected. **High Accuracy**: Advanced algorithms can detect faces even in different lighting conditions.	**Environmental Limitations**: Poor lighting or extreme angles may affect recognition. **Privacy Concerns**: Storing facial data raises privacy and security issues. **False Positives/Negatives**: Can have difficulty distinguishing between similar faces or detecting masks/hats.
(C) Iris/Retina Scan	**Highly Secure**: Iris or retina patterns are more unique than fingerprints. **Contactless**: Eliminates hygiene concerns.	**Expensive**: Requires advanced, costly hardware. **User Discomfort**: Some users may find it uncomfortable to scan their eyes. **Limited Deployment**: Less commonly used in everyday scenarios compared to other biometric methods.
RFID-based Attendance		
A)Card Swipe	**Low Cost**: Simple technology that's widely available. **Easy to Implement**: Simple setup process. **Reliable**: Can handle a large number of users with minimal error.	**Lost or Damaged Cards**: Users may lose their RFID cards, and they can be easily damaged. **Proxy Attendance**: Cards can be shared, leading to buddy punching. **Maintenance**: Readers may require regular maintenance.

(B) Contactless RFID/NFC	**Convenient**: Users only need to tap or get close to the reader. **Fast**: Quick and efficient for high-traffic environments.	**Risk of Proxy Attendance**: NFC cards or phones can be passed around. **Initial Setup Cost**: Requires readers and cards to be distributed to everyone. **Security Concerns**: NFC signals can potentially be intercepted if not secured properly.
QR Code-based Attendance	**Easy to Implement**: Users only need a smartphone and a QR code scanner. **Contactless**: No physical contact, making it hygienic. **Low Cost**: No need for specialized hardware except a smartphone camera.	**Dependence on Smartphones**: Users without smartphones are excluded. **Cheating**: QR codes can be shared or replicated. **Slower for Large Groups**: Scanning QR codes for large groups can take time.
Mobile-based Attendance (A) GPS-based	**Remote Attendance**: Ideal for field workers or remote employees. **Accurate**: Tracks exact location, preventing false check-ins.	**Battery Drain**: Continuous GPS usage can quickly drain device batteries. **Privacy Concerns:** Constant location tracking may raise concerns about user privacy. **Signal Issues**: GPS accuracy depends on good signal reception, which can be problematic indoors or in remote areas.
(B) App Check-ins	**User-friendly**: Easy for employees to check in/out using a mobile app. **Customizable**: Apps can be designed to meet specific organizational needs.	**Smartphone Dependency**: Requires users to own and operate a smartphone. **Cheating**: Users can manipulate the system by checking in/out remotely or using VPNs. **App Maintenance**: Apps need regular updates to function efficiently.
Proximity Sensor-based Attendance		
(A)Bluetooth/Beacon	**Automated**: Attendance is automatically marked when users are in proximity, reducing manual input. **Contactless**: No need for physical interaction with devices.	**Range Limitations**: Effective only within a specific range. **Device Compatibility:** Not all devices may support Bluetooth attendance systems. **Battery Usage**: Proximity sensors can drain mobile device batteries quickly.
OTP-based Attendance	**Secure**: Each login is authenticated with a one-time password. **No Specialized Equipment**: Users only need access to a phone or email.	**Manual Entry**: Requires users to enter an OTP, which can be slower than other methods. **Dependence on Connectivity**: Requires network access to receive OTPs. **Potential Delays**: Delay in OTP delivery can slow down attendance marking.

Automated Time Clocks	**Fast**: Easy and quick to use for clocking in/out. **Simple**: Requires minimal technical knowledge to operate.	**Physical Interaction**: Users must interact with a device, which can raise hygiene concerns. **Proxy Attendance**: Similar to RFID systems, users may punch in for others. **Maintenance**: Time clocks need periodic maintenance.