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Here's a simplified, **MCQ-friendly** version of the **Week 11 and 12 notes**, formatted for **easy learning and quick revision**:

📘 Week 11: IIoT and Smart Grid/Home

🏭 Industrial Internet of Things (IIoT)

- Connects **hardware and software**.
- Goals: **Remote access**, **end-to-end security**, **cloud integration**, **big data use**, **smart machines**.

⚙️ IIoT Requirements

- **Connectivity** (hardware/software)
- **Cloud platform**
- **App development support**
- **Big data analytics**

🛠️ Design Considerations

- **Energy**: Battery life
- **Latency**: Delay in data transfer
- **Throughput**: Max data transfer rate
- **Scalability**: No. of devices supported
- **Topology**: Device communication structure
- **Security**: Reliability and safety

🛎️ IIoT Services

- **Primary services**: Core node tasks
- **Secondary services**: Supportive functions

🚚 IIoT Applications

- **Transportation & Logistics**: **Barcodes, RFID**, real-time object tracking

- **Mining: Air quality, gas detection, Wi-Fi, RFID**

⚡ Smart Grid

- Features:
  - **Real-time monitoring**
  - **Smart appliance control**
  - **Building automation**
  - **Real-time pricing**
  - **Renewable energy integration**
  - **Distribution automation**

🏠 Smart Home in Smart Grid

- **Smart Meters**: Interface with provider, automated info transfer, cost reduction
- **Smart Appliances**: Respond to provider signals, can be overridden
- **Home Energy Generation**: **Solar**, **wind**, **hydropower**, **fuel cells**
- **Home Energy Management System**: Schedules appliances for off-peak use

🔁 Consumer Engagement

- **Net Metering**: Paid more during on-peak energy supply

🔌 Smart Grid Operation

- Uses **PMUs** for monitoring transmission systems
- PMUs send data to **SCADA**
- Grid features **self-healing**, **power rerouting**, and **oscillation damping**

🚗 Plug-in Electric Vehicles (PEVs)

- Charged during **off-peak hours**
- Can **supply power** back during peak time

📘 Week 12: Data Handling and Analytics in IoT

📦 Data Handling

- Focuses on **secure data storage, archiving, and disposal**
- Applies to **electronic and non-electronic** data

📊 Data Analytics

- Examines datasets to **derive insights**
- Supports **business decisions**, **scientific verification**

📈 Types of Data Analysis

📎 Qualitative

- Descriptive (text, video, interviews)
- Data grouped by **themes**

🔢 Quantitative

- **Numerical data** (mean, median, std. dev.)
- Techniques:
  - **Correlation** (Pearson's *r*)
  - **Regression**
  - **Statistical Significance**
  - **Margin of Error** = Critical Value × Std. Deviation

ANOVA Assumptions

Normal distribution

Equal variances (homogeneity)

Independent samples

Examples of dispersion measures include Range and Variance

☁️ Data Handling Technologies

- **Cloud Computing**: On-demand, scalable services
  - Models: **IaaS**, **PaaS**, **SaaS**
- **IoT**: Physical objects connected to the internet

🔄 Flow of Data

1. **Generation**
2. **Acquisition** (collection, transport, pre-process)
3. **Storage**
4. **Analysis**

🗂️ Data Sources

- **Enterprise**, **IoT**, **Bio-medical**, **Others** (e.g., astronomy)

🎛️ Data Acquisition

- **Log files** (activity)
- **Sensory data** (temp, sound, etc.)

📚 Big Data Characteristics

- **Volume**: Huge data (e.g., 140M tweets/day)
- **Variety**: Text, images, video, GPS, sensor data

🐘 Hadoop Components

- **NameNode**: Filesystem metadata, in-memory maps
- **DataNode**: Stores data, communicates for balancing/replication
- **Job Tracker**: Manages user jobs
- **Task Trackers**: Execute tasks on nodes

🏥 IoT in Healthcare

- **Telemedicine**: Remote patient monitoring
- **Emergency Response**: Faster care during complications

- **Digital Medical Records**: Cloud storage
- **AmbuSens**: Monitors heart rate, ECG, temp using **WBAN (Bluetooth)**

⚙️ **AmbuSens Focus:**

- **Power efficiency**
- **Data-rate tuning**
- **Filtering & noise removal**

👩‍⚕️ **Post-Disaster Care:**

- Uses **cloud-WBAN**
- Includes **social choice models**, **dynamic gateways**

📶 **WBAN Scheduling:**

- **Priority-based slots** for critical health data
- Fitness = **Criticality + Energy + History**

🧍 Human Activity Recognition

- Detects activities like **running, jumping, gestures**
- Sensors: **Cameras, smartphones, fitness bands**
- Uses **ML/DL** for data analysis (on-device or network-based)

Let me know if you'd like a **summary sheet**, **flashcards**, or **MCQs** made from these!