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|  | Internet of Things  Practical #1 | | |
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| **Name** | SIMRAN SINGH | **Division** | D |
| **Class** | T.Y.B.Sc.DS | **Roll Number** | 23302D0004 |
| **Practical 1** | Starting Raspbian OS, familiarizing with raspberry pi components and Interface, connecting  to ethernet, monitor, USB. | | |
|  |  |  | Date: 1-7-25 |
| **Procedure to install Rasbian OS** | | | |
| **1. Prerequisites**  Before installing Raspberry Pi OS, ensure you have:   * A Raspberry Pi board (any model) * A microSD card (minimum 8GB, Class 10 recommended) * A microSD card reader (if your computer doesn’t have one) * A computer (Windows/macOS/Linux) * A stable internet connection (for downloading the OS image) * Raspberry Pi Imager (official tool) or Balena Etcher (alternative)     **2. Download Raspberry Pi OS**   1. Visit the official Raspberry Pi website: <https://www.raspberrypi.com/software/> 2. Under "Raspberry Pi OS", choose:    1. Raspberry Pi OS (32-bit) – Recommended for most users    2. Raspberry Pi OS Lite (32-bit) – No desktop (for headless setups)    3. Raspberry Pi OS (64-bit) – For advanced users (better performance on Pi 3/4/5) 3. Download the .zip or .xz file.     **3. Flash Raspberry Pi OS to the microSD Card**  Method 1: Using Raspberry Pi Imager (Easiest)   1. Download Raspberry Pi Imager from <https://www.raspberrypi.com/software/> 2. Insert the microSD card into your computer. 3. Open Raspberry Pi Imager. 4. Choose OS → Select Raspberry Pi OS (32-bit or 64-bit). 5. Choose Storage → Select your microSD card. 6. (Optional) Click the gear icon (⚙️) to:    1. Set hostname (e.g., raspberrypi.local)    2. Enable SSH (for remote access)    3. Configure Wi-Fi (if using headless mode)    4. Set username & password (default: pi/raspberry) 7. Click "Write" and wait for the process to complete.     **4. Boot Raspberry Pi for the First Time**   1. Insert the microSD card into the Raspberry Pi. 2. Connect peripherals (keyboard, mouse, monitor via HDMI). 3. Power on the Pi using a USB-C (Pi 4/5) or Micro-USB (Pi 3/Zero) power supply. 4. First-time setup (if using Raspberry Pi OS with Desktop):    1. Select language, timezone, and keyboard layout.    2. Set a new password (default: pi/raspberry).    3. Connect to Wi-Fi (if needed).    4. Update software (recommended). | | | |
| **Configuring Raspi.** | | | |
| **1. Initial Setup**   * Run sudo raspi-config * Set hostname (iot-pi-1) * Change default password * Set timezone & keyboard   **2. Network**   * Assign **static IP** (edit /etc/dhcpcd.conf) * Enable **WiFi** (nmcli or raspi-config)   **3. Remote Access**   * Enable **SSH** (via raspi-config or touch /boot/ssh) * Enable **VNC** (for GUI access)   **4. IoT Hardware Setup**   * Enable **I2C, SPI, Serial** in raspi-config * Add user to **GPIO group**:     **5. Security**   * **Update system**:     **6. Test**   * Reboot & verify settings: | | | |
| **State the Linux Commands used for File System.** | | | |
| **1. Navigation**   * pwd – Show current directory * ls – List files/folders   + ls -l (detailed)   + ls -a (show hidden) * cd <dir> – Change directory   + cd .. (go back)   + cd ~ (go home)   **2. File Operations**   * touch <file> – Create empty file * cat <file> – Display file content * nano <file> – Edit file (Ctrl+X to exit) * cp <source> <dest> – Copy file/folder * mv <source> <dest> – Move/rename * rm <file> – Delete file   + rm -r <dir> (delete folder)   + rm -f (force delete)   **3. Directory Operations**   * mkdir <dir> – Create folder * rmdir <dir> – Delete empty folder * tree – Display folder structure   **4. Permissions**   * chmod +x <file> – Make executable * chown <user>:<group> <file> – Change owner   **5. Disk & Storage**   * df -h – Show disk space * du -sh <dir> – Check folder size * mount – List mounted drives   **6. Search & Find**   * find / -name "file.txt" – Search system * grep "text" <file> – Find text in file   **7. Compression**   * tar -czvf archive.tar.gz <dir> – Create .tar.gz * unzip file.zip – Extract ZIP | | | |
| **State the Linux Commands used for Networking** | | | |
| **1. Basic Network Info**   * ifconfig or ip a – Show IP addresses * iwconfig – Wireless network info * hostname -I – Quick IP check (RPi) * ping google.com – Test internet connection     **2. Connection Management**   * nmcli – NetworkManager CLI tool   + nmcli dev wifi list – Scan WiFi   + nmcli dev wifi connect "SSID" password "PASS" – Connect to WiFi * iwlist wlan0 scan – Detailed WiFi scan     **3. SSH & Remote Access**   * ssh user@ip – Connect via SSH * scp file.txt user@ip:/path – Copy files over SSH * rsync -avz /local/path user@ip:/remote/path – Sync files     **4. Port & Firewall**   * netstat -tuln – List open ports * ss -tuln (modern alternative) * sudo ufw allow 22 – Allow SSH (UFW firewall)     **5. DNS & Hosts**   * dig google.com – DNS lookup * nslookup google.com – Check DNS resolution * Edit /etc/hosts – Manual hostname mapping     **6. Troubleshooting**   * traceroute google.com – Network path check * mtr google.com – Advanced traceroute * arp -a – Show ARP table (local devices) | | | |