



1. Read the man pages for the following commands: **arp ifconfig route host ping tcpdump** and **netstat**. Study the different options associated with each command. Explain each of the above commands in 2-3 sentences. [25]
2. Follow the below instructions to set up a virtual network and write down the interfaces (along with IP address) of each of the VMs in this network: [20]
 - Download the file “lab1_network.tar.xz” from the folder lab1.
 - Extract this file and step into the extracted directory.
 - Setup the virtual machines by issuing the command “./setupVMs.sh”
 - Start the virtual machines by issuing the command “./startVMs.sh”
 - There are 6 VMs in this network namely **h1, h2, h3, h4, h5, r1, r2, r3**. The first 5 VMs are hosts and the rest are routers. You can connect to VM **x** by issuing the command “./connect.sh x”.
3. Deduce and write down the complete network topology, including details about interfaces, IP address, subnet, and MAC address. [30]
4. Does this network have an authoritative DNS server? If yes, give its IP and the port it is listening on. [5]
5. Find out the IP address for domain “www.google.com”. What is the IP address of the first hop node on the path to “www.google.com”? [5]
6. List the ports on which services are listening on each VMs, and also identify these services. [10]
7. Do a reverse DNS lookup on all the IPs in the virtual network and note them down. [5]