



1.0 Networking Concepts

1.1 Explain the purposes and uses of ports and protocols.

- **Protocols and ports**
 - SSH 22
 - DNS 53
 - SMTP 25
 - SFTP 22
 - FTP 20, 21
 - TFTP 69
 - TELNET 23
 - DHCP 67, 68
 - HTTP 80
 - HTTPS 443
- **SNMP 161**
- **RDP 3389**
- **NTP 123**
- **SIP 5060, 5061**
- **SMB 445**
- **POP 110**
- **IMAP 143**
- **LDAP 389**
- **LDAPS 636**
- **H.323 1720**
- **Protocol types**
 - ICMP
 - UDP
 - TCP
 - IP
- **Connection-oriented vs. connectionless**

1.2 Explain devices, applications, protocols and services at their appropriate OSI layers.

- **Layer 1 – Physical**
- **Layer 2 – Data link**
- **Layer 3 – Network**
- **Layer 4 – Transport**
- **Layer 5 – Session**
- **Layer 6 – Presentation**
- **Layer 7 – Application**

1.3 Explain the concepts and characteristics of routing and switching.

- **Properties of network traffic**
 - Broadcast domains
 - CSMA/CD
 - CSMA/CA
 - Collision domains
 - Protocol data units
 - MTU
 - Broadcast
 - Multicast
 - Unicast
- **Segmentation and interface properties**
 - VLANs
 - Trunking (802.1q)
 - Tagging and untagging ports
 - Port mirroring
 - Switching loops/spanning tree
 - PoE and PoE+ (802.3af, 802.3at)
 - DMZ
- **MAC address table**
- **ARP table**
- **Routing**
 - Routing protocols (IPv4 and IPv6)
 - Distance-vector routing protocols
 - RIP
 - EIGRP
 - Link-state routing protocols
 - OSPF
 - Hybrid
 - BGP
 - Routing types
 - Static
 - Dynamic
 - Default
- **IPv6 concepts**
 - Addressing
 - Tunneling
- **Dual stack**
- **Router advertisement**
- **Neighbor discovery**
- **Performance concepts**
 - Traffic shaping
 - QoS
 - Diffserv
 - CoS
- **NAT/PAT**
- **Port forwarding**
- **Access control list**
- **Distributed switching**
- **Packet-switched vs. circuit-switched network**
- **Software-defined networking**



1.4 Given a scenario, configure the appropriate IP addressing components.

- Private vs. public
 - Loopback and reserved
 - Default gateway
 - Virtual IP
 - Subnet mask
- Subnetting
 - Classful
 - Classes A, B, C, D, and E
 - Classless
 - VLSM
 - CIDR notation (IPv4 vs. IPv6)
- Address assignments
 - DHCP
 - DHCPv6
 - Static
 - APIPA
 - EUI64
 - IP reservations
-

1.5 Compare and contrast the characteristics of network topologies, types and technologies.

- Wired topologies
 - Logical vs. physical
 - Star
 - Ring
 - Mesh
 - Bus
 - Wireless topologies
 - Mesh
 - Ad hoc
 - Infrastructure
- Types
 - LAN
 - WLAN
 - MAN
 - WAN
 - CAN
 - SAN
 - PAN
- Technologies that facilitate the Internet of Things (IoT)
 - Z-Wave
 - Ant+
 - Bluetooth
 - NFC
 - IR
 - RFID
 - 802.11
-

1.6 Given a scenario, implement the appropriate wireless technologies and configurations.

- 802.11 standards
 - a
 - b
 - g
 - n
 - ac
 - Cellular
 - GSM
 - TDMA
 - CDMA
- Frequencies
 - 2.4GHz
 - 5.0GHz
 - Speed and distance requirements
 - Channel bandwidth
 - Channel bonding
 - MIMO/MU-MIMO
 - Unidirectional/omnidirectional
 - Site surveys



1.7 Summarize cloud concepts and their purposes.

- **Types of services**
 - SaaS
 - PaaS
 - IaaS
 - **Cloud delivery models**
 - Private
 - Public
 - Hybrid
 - **Connectivity methods**
 - **Security implications/considerations**
 - **Relationship between local and cloud resources**
-

1.8 Explain the functions of network services.

- **DNS service**
 - Record types
 - A, AAAA
 - TXT (SPF, DKIM)
 - SRV
 - MX
 - CNAME
 - NS
 - PTR
 - Internal vs. external DNS
 - Third-party/cloud-hosted DNS
 - Hierarchy
 - Forward vs. reverse zone
- **DHCP service**
 - MAC reservations
 - Pools
 - IP exclusions
 - Scope options
 - Lease time
 - TTL
 - DHCP relay/IP helper
- **NTP**
- **IPAM**