Question One

192. 168. 22. 0/26

A (i) Subnets

Bits=26

Bits for host portion=32

32-26=6

IP address to binary: 192.168.22.0=11000000.10101000.00010110.00000000

Subnet Mask: 255.255.255.192

Number of subnets=2**(32-26) =64

Subnet broadcast size=192.168.22.64 (0+64)

Last host address=192.168.22.63 (64-1)

(ii) Usable IP addresses

The first address/subnet address (192. 168. 22. 0) and last address/subnet broadcast address (192.168.22.63) are not usable therefore we have 62 usable IP addresses.

(iii) Magic number is the first usable IP address.

Magic number=192.168.22.1

(C)

Subnet	IP Address range	Broadcast Address
192.168.22.0/26	192.168.22.1-192.168.22.62	192.168.22.63
192.168.22.64/26	192.168.22.65-192.168.22.126	192.168.22.127
192.168.22.128/26	192.168.22.129-192.168.22.190	192.168.22.191
192.168.22.1536/26	192.168.22.1537-192.168.22.190	192.168.22.1601

C (i) 11110010.10100101.00001111

.00010000

=242.165.15.16

(ii) 11111111.11111111.11111111.11100000

=255.255.255.224

(iii)11111111.00000000.00000000.00000000

=255.0.0.0

(D)(i) 192.168.10.1

=11000000.10101000.00001010.00000001

(ii)117

=01110101

(iii)224

=11100000

(E)(i)125

=01111101

=0111 1101

=7D

(ii)192

=11000000

=1100 0000

=C0

(iii)224

=11100000

=1110 0000

=E0

Question Two

(a)User Executive Mode

In this mode a user can perform basic commands such as configuring interfaces and viewing system information.

Interface Configuration Mode

This allows configuration of specific interfaces like Wi-Fi and ethernet for IP addressing and subnet masking.

Global Configuration Mode

This mode enables configuration of system wide settings such as the network settings, domain name and hostname. Also allows configuration of routing protocols and Quality of Service.

(b) The first step would be to access the router using either a console cable or Telnet.

The second step would be to set up the hostname using the command: hostname <name>

The third step is to secure the configuration modes. In this step one must set a password for Privilege Executive Mode using the command: enable password <password>. Then one must set up a password for Global Configuration Mode using the command: enable secret password<password>. The user must then encrypt passwords using command: service password-encryption.

The user must then secure remote access in the fourth step by setting up a password for VTY(SSH/Telnet) access using command: line vty 0 4 password <password>. Next the user has to set the login protocol to SSH using command: IP SSH authentication-retries 3

The fifth step would be for the user to configure the Message of The Day banner using the command: banner motd # <message> #.

The final step would be for the user to save the configuration using the command: write memory or copy running-config startup-config.

Question Three

(A)The switch is a device that operates in the data link layer which determines where to send each incoming message frame by looking at the media access control address.

The switch differs from the router in the following ways;

A switch connects multiple devices within a LAN while a router connects multiple networks.

A switch creates a collision domain for each port while a router creates a broadcast domain.

(B)One type of cable used in LANs are copper cables. Copper cables are easier to install, test and maintain.

Another type of cable used in LANs are fiber optic cables. Fiber optic cables are faster, have a much higher transmission rate and are thinner than copper cables.

(C)(a) Bandwidth is the measure of the maximum capacity of data that can transmitted by a wired or wireless communication link over a network in a given time.

(b) Latency the delay between when a user enters a request on a network and when they get a response.

(c) Throughput is the rate of message delivery over a communication channel.

(d) Goodput is the ratio between delivered amount of information and the total delivery time.