QUESTION 1

A

(i) The subnets

IP address: 192.168.22.0

Prefix length: /26

Subnet mask=255.255.255.192

No. of subnets = 2^ (prefix length-24)

=2^ (26-24)

=2^2

=4 subnets

The number of subnets in 192.168.22.0/26 address is 4.

(ii) Usable IP address.

Total no. of hosts

=2^ (32-26)

=2^6

=64

Usable IP addresses= no. of hosts -2

=64-2

=62 \*4

=248

The no. of usable IP addresses in 192.168.22.0/26 is 248

(iii) Magic Number

Host bits=32-26

=6

Magic number=2^6-2

=64-2

Magic number =62

B

|  |  |  |
| --- | --- | --- |
| Subnets | IP Address Range(First Usable – Last Usable) | Broadcast Address. |
| 192.168.22.0 | 192.168.22.1-192.168.22.62 | 192.168.22.63 |
| 192.168.22.64 | 192.168.22.65-192.168.22.126 | 192.168.22.127 |
| 192.168.22.128 | 192.168.22.129-192.168.22.190 | 192.168.22.191 |
| 192,168.22. | 192.168.22.193-192.168.22.254 | 192.168.22.254 |

C

COVERTING TO DOTTED DECIMAL

(i) 1111000.11111111.00001111.00010000

1111000

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |

(1\*2^7)+(1\*2^6)+(1\*2^5)+(1\*2\*4)+(1\*2^3)+(0\*2^2)+(0\*2^1)+(0\*2^1)+(0\*2^0)

=128+64+32+16+8+0+0+0

248

11111111

=(1\*2^7)+(1\*2^6)+(1\*2^5)+(1\*2^4)+(1\*2^3)+(1\*2^2)+(1\*2^1)+(1\*2^0)

=128+64+32+16+8+4+2+1

=257

00001111

=(0\*2^7)+(0\*2^6)+(0\*2^5)+(0\*2^4)+(1\*2^3)+(1\*2^2)+(1\*2^1)+(1\*2^0)

=15

0001000

=(0\*2^7)+(0\*2^6)+(0\*2^5)+(1\*2^4)+(0\*2^3)+(0\*2^2)+(0\*2^1)+(0\*2^0)

=16

11110000.11111111.00001111.00010000= 248.257.17.16

(ii) 11111111.11111111.11111111.11100000

11111111

=(1\*2^7)+(1\*2^6)+(1\*2^5)+(1\*2^4)+(1\*2^3)+(1\*2^2)+(1\*2^1)+(1\*2^0)

=128+64+32+16+8+4+2+1

=257

11111111

=(1\*2^7)+(1\*2^6)+(1\*2^5)+(1\*2^4)+(1\*2^3)+(1\*2^2)+(1\*2^1)+(1\*2^0)

=128+64+32+16+8+4+2+1

=257

11111111

=(1\*2^7)+(1\*2^6)+(1\*2^5)+(1\*2^4)+(1\*2^3)+(1\*2^2)+(1\*2^1)+(1\*2^0)

=128+64+32+16+8+4+2+1

=257

11100000

=(1\*2^7)+(1\*2^6)+(1\*2^5)+(0\*2^4)+(0\*2^3)+(0\*2^2)+(0\*2^1)+(0\*2^0)

=128+64+32+0+0+0+0+0

=224

11111111.11111111.11111111.11100000= 257.257.257.222

(iii) 11111111.00000000.00000000.00000000

11111111

=(1\*2^7)+(1\*2^6)+(1\*2^5)+(1\*2^4)+(1\*2^3)+(1\*2^2)+(1\*2^1)+(1\*2^0)

=128+64+32+16+8+4+2+1

=257

00000000

=(0\*2^7)+(0\*2^6)+(0\*2^5)+(0\*2^4)+(0\*2^3)+(0\*2^2)+(0\*2^1)+(0\*2^0)

=0

00000000

=(0\*2^7)+(0\*2^6)+(0\*2^5)+(0\*2^4)+(0\*2^3)+(0\*2^2)+(0\*2^1)+(0\*2^0)

=0

00000000

=(0\*2^7)+(0\*2^6)+(0\*2^5)+(0\*2^4)+(0\*2^3)+(0\*2^2)+(0\*2^1)+(0\*2^0)

=0

11111111.00000000.00000000.00000000=257.0.0.0

D

Converting to binary numbering system

(i) 192.168.10.1

192= 168=

|  |  |  |
| --- | --- | --- |
| 2 | 168 | 0 |
| 2 | 84 | 0 |
| 2 | 42 | 0 |
| 2 | 21 | 1 |
| 2 | 10 | 0 |
| 2 | 5 | 1 |
|  | 2 | 0 |
|  | 1 |  |

|  |  |  |
| --- | --- | --- |
| 2 | 192 | 0 |
| 2 | 96 | 0 |
| 2 | 48 | 0 |
| 2 | 24 | 0 |
| 2 | 12 | 0 |
| 2 | 6 | 0 |
| 2 | 3 | 1 |
|  | 1 |  |

=10101000

=11000000

10= 1=00000001

|  |  |  |
| --- | --- | --- |
| 2 | 10 | 0 |
| 2 | 5 | 1 |
| 2 | 2 | 0 |
|  | 1 |  |

=00001010

192.168.10.1=11000000.10101000.00001010.00000001

(ii) 117

|  |  |  |
| --- | --- | --- |
| 2 | 117 | 1 |
| 2 | 58 | 0 |
| 2 | 29 | 1 |
| 2 | 14 | 0 |
| 2 | 7 | 1 |
| 2 | 3 | 1 |
|  | 1 |  |

117=01110101

(iii) 224

|  |  |  |
| --- | --- | --- |
| 2 | 224 | 0 |
| 2 | 112 | 0 |
| 2 | 56 | 0 |
| 2 | 28 | 0 |
| 2 | 14 | 0 |
| 2 | 7 | 1 |
| 2 | 3 | 1 |
|  | 1 |  |

224=11100000

E

Converting to hex decimal numbering system

(i) 125= 01111101 binary

0111 is 7

1101 is D

Therefore 125 is 7D in hexadecimal

(ii)192= 11000000 binary

1100 is C

0000 is 0

Therefore 192 is C0 in hexadecimal

(iii)224=11100000 binary

1110 is E

0000 is 0

Therefore 224 is E0 in hexadecimal

Question Two

a) The User mode which is the default mode that enables the user to view the configurations, perform operations as well as trouble shooting.

The enable mode which allows the user to view and modify configurations, execute commands as well as performing maintenance tasks.

The configuration mode which allows the user to modify the device’s configuration and as well create and delete interfaces.

b) Steps followed to perform basic configuration of a router.

Step 1: initial configuration

1. Connect the router using the console cable.

2. Power on the router.

3. Press enter to access the router’s command line interface.

Step 2: Set hostname.

1. Enter Enable mode: (Enable)

2. Configure hostname: (conf. t)

3. Set hostname: (hostname <Router 1>)

4. Exit configuration mode: (end)

Step 3: Secure configuration modes

1. Set enable secrete password:

2. Set enable password:

3. Encrypt password:

Step 4: Secure remote access.

1. Configure SSH:

2. Generate SSH keys:

3. Set SSH login attempts:

Step 5: Configure MOTD Banner

1. Configure MOTD Banner:

2. Enter banner text:

3. End banner configuration:

Step 6: Save Configuration

1. Save configuration:

Step 7: Verify Configuration

1. Verify hostname:

2. Verify configuration modes:

3. Verify SSH configuration:

4. Verify MOTD banner:

Question three

A.

A switch connects multiple devices with in a LAN and forwards data packets between them while a router connects multiple LANs and rotes traffic between them.

B.

Cables used in LAN.

Twisted pair cable:

It is cost effective and can easily be installed within the network.

Fiber optical cable:

It facilitates high speed and long distance transmissions.

C.

a. Bandwidth:

This is the maximum amount of data that can be transmitted over a network at a given period of time.

b. Latency:

This is the time taken for data to travel from the sending device to the receiver.

c. Throughput:

This is the actual amount of data that is successfully transmitted over a network in a given period of time.

d. Goodput:

This is the useful data transferred over the network.