Master of engineering in internetworking engineering essay

Engineering

Lab Assignment #3

IPv4 Addressing

INWK 6111

SECTION – 1

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Question No. 1

Binary

Decimal

MSC128+64+32+16+8+4+2LSB+110011000

152

00001010

10

10100001

161

01110010

114

01111111

127

11000001

193

11101100

236

1

1

1

1

1

1

0

0

252

1

1

1

1

1

1

1

1

255

1

1

0

0

0

0

0

0

192

1

1

0

1

0

0

1

0

210

1

1

1

0

0

0

0

0

224The following table shows example of binary numbers and their corresponding decimal values. Fill the rest of the table.

Question No. 2

What is the maximum decimal value of an eight bit number?

WEIGHT

1286432168421

TOTAL = 255

BIT

11111111

Question No. 3

Find the answer for the next two operations?

PART 1:

BINARY REPRESENTATION

1100110011010111

1

1

0

0

0

1

0

0

AND

PART 2:

BINARY REPRESENTATION

0111110000010111

0

0

0

1

0

1

0

0

AND

Question No. 4

Find the network portion of the following IP address using their subnet masks? Part 1:

DOTTED DECIMAL REPRESENTATION

126266711255255248012626640

AND

BINARY REPRESENTATION

| ----------IP ADDRESS----------|

| 01111110 00011010 01000011 00001011 | IP ADDRESS_AND_ | 11111111 11111111 11110000_00000000 | _SUBNET MASK_____

| 01111110 00011010 01000000 00000000 | NETWORK PORTION

Part 2:

DOTTED DECIMAL REPRESENTATION

20890125519200206400

AND

BINARY REPRESENTATION

| ----------IP ADDRESS----------|

| 00010100 01011011 00000000 00000001 | IP ADDRESS_AND_ | 11111111 11000000 01000000_ 00000000 | _SUBNET MASK_____

| 00010100 01000000 00000000 00000000 | NETWORK PORTION

Question No. 5

Identify the class of each IP address and write the network and the host components.

Address

Class

Network

Host

172. 16. 1. 1B172. 16. 0. 00. 0. 1. 1245. 233. 1. 1EUndefinedUndefined15. 0. 16. 9A15. 0. 0. 00. 0. 16. 9180. 25. 0. 1B180. 25. 0. 00. 0. 0. 1125. 125. 125. 125A125. 0. 0. 00. 125. 125. 125192. 168. 6. 1C192. 168. 6. 00. 0. 0. 110. 10. 10. 0A10. 0. 0. 00. 10. 10. 0

Question No. 6

How many network IDs and host IDs is available in classes A, B, and C?

0Network (7 bits)Host (24 bits)

Class A

Total Number of Networks = 2^7 = 128

Total Available Hosts = (2^24) – 2 = 16777214

10Network (14 bits)Host (16 bits)

Class B

Total Number of Networks = 2^14 = 16384

Total Available Hosts = (2^16) – 2 = 65534

110Network (21 bits)Host (8 bits)

Class C

Total Number of Networks = 2^21 = 2097152

Total Available Hosts = (2^8) – 2 = 62

Question No. 7

Determine the subnet mask, the network ID, and the broadcast address in the following. 201. 212. 10. 40/29

DOTTED DECIMAL REPRESENTATION

_____

| 201. 212. 10. 40 | IP ADDRESS_AND_ | 255. 255. 255. 248 | _SUBNET MASK_____

| 210. 212. 10. 40 | NETWORK PORTION

| 210. 212. 10. 47 | BROADCAST ADDRESS

BINARY REPRESENTATION

_____

| 11001001 11010100 00001010 00101| 000 | IP ADDRESS_AND_ | 11111111 11111111 11111111 11111| 000 | _SUBNET MASK_____

| 11001001 11010100 00001010 00101| 000 | NETWORK PORTION

| 11001001 11010100 00001010 00101| 111 | BROADCAST ADDRESS

115. 16. 193. 6/21

DOTTED DECIMAL REPRESENTATION

_____

| 115. 16. 193. 6 | IP ADDRESS_AND_ | 255. 255. 248. 0 | _SUBNET MASK_____

| 115. 16. 192. 0 | NETWORK PORTION

| 115. 16. 199. 255 | BROADCAST ADDRESS

BINARY REPRESENTATION

_____

| 01110011 00010000 11000| 001 00000110 | IP ADDRESS_AND_ | 11111111 11111111 11111| 000 00000000 | _SUBNET MASK_____

| 01110011 00010000 11000| 000 00000000 | NETWORK PORTION

| 01110011 00010000 11000| 111 11111111 | BROADCAST ADDRESS

128. 16. 54. 13/30

DOTTED DECIMAL REPRESENTATION

_____

| 128. 16. 54. 13 | IP ADDRESS_AND_ | 255. 255. 255. 252 | _SUBNET MASK_____

| 128. 16. 54. 12 | NETWORK PORTION

| 128. 16. 54. 15 | BROADCAST ADDRESS

BINARY REPRESENTATION

_____

| 10000000 00010000 00110110 000011| 01 | IP ADDRESS_AND_ | 11111111 11111111 11111111 111111| 00 | _SUBNET MASK_____

| 10000000 00010000 00110110 000011| 00 | NETWORK PORTION

| 10000000 00010000 00110110 000011| 11 | BROADCAST ADDRESS

153. 50. 6. 27/25

DOTTED DECIMAL REPRESENTATION

_____

| 153. 50. 6. 27 | IP ADDRESS_AND_ | 255. 255. 255. 128 | _ SUBNET MASK_____

| 153. 50. 6. 0 | NETWORK PORTION

| 153. 50. 6. 127 | BROADCAST ADDRESS

BINARY REPRESENTATION

_____

| 10011001 00110010 00000110 0| 0011011 | IP ADDRESS_AND_ | 11111111 11111111 11111111 1| 0000000 | _SUBNET MASK_____

| 10011001 00110010 00000110 0| 0000000 | NETWORK PORTION

| 10011001 00110010 00000110 0| 1111111 | BROADCAST ADDRESS

Question No. 8

Is it possible to further subnet the previous IP address? How many subnets can be created, if any? How many host in each? Note: We can make subnet up to 30th bit in the 32-bit IP address.

201. 212. 10. 40/29

In the case, we can borrow one more bit from the host part to make subnets. Following will be the total number subnets and usable host Ids. CLASS C ADDRESS

----------NETWORK PORTION---------- | SUBNET | HOST PORTION

11001001 11010100 00001010| 00101| 00011111111 11111111 11111111| 11111| 000Number of Subnets = 2^ (subnet bits) = 2^5 = 32 SubnetsNumber of Usable Host ID = [2^ (host bits)] – 2 = (2^3) – 2 = 8-2 = 6 hosts / subnets

115. 16. 193. 6/21

In the case, we can borrow 9 more bits from the host part to make subnets. Following will be the total number subnets and usable host Ids. CLASS A ADDRESS

NETWORK PORTION |--------- SUBNET--------- -| HOST PORTION

01110011 | 00010000 11000| 001 0000011011111111 | 11111111 11111| 000 00000000Number of Subnets = 2^ (subnet bits) = 2^13 = 8192 SubnetsNumber of Usable Host ID = [2^ (host bits)] – 2 = (2^12) – 2 = 4096-2 = 4094 hosts / subnets

128. 16. 54. 13/30

In this scenario, we cannot borrow any bit from the host part to make the subnets as we at-least require 4 host address (i. e. 2 host for point to point communication, one for network address and one for broadcast address).

153. 50. 6. 27/25

In the case, we can borrow 5 more bits from the host part to make subnet. Following will the total number subnets and usable host Ids. CLASS B ADDRESS

----------NETWORK PORTION--- |---- SUBNET------| HOST PORTION

10011001 00110010 | 00000110 0| 001101111111111 11111111 |

11111111 1| 0000000Number of Subnets = 2^ (subnet bits) = 2^9 = 512

SubnetsNumber of Usable Host ID = [2^ (host bits)] – 2 = (2^7) – 2 = 128-2

= 126 hosts / subnets

Question No. 9

Which of the following address is invalid? 111. 12. 10. 4/25

DOTTED DECIMAL REPRESENTATION

_____

| 111. 12. 10. 4 | IP ADDRESS_AND_ | 255. 255. 255. 128 | _ SUBNET

MASK_____

| 111. 12. 10. 0 | NETWORK PORTION

| 111. 12. 10. 1 | FIRST HOST ADDRESS

| 111. 12. 10. 126 | LAST HOST ADDRESS

| 111. 12. 10. 127 | BROADCAST ADDRESS

BINARY REPRESENTATION

_NETWORK PART___SUBNET PART_____HOST PART_____ _____

| 01101111 | 00001100 00001010 0| 0000100 | IP ADDRESS_AND_ |

11111111 | 11111111 11111111 1| 0000000 | _SUBNET MASK_____

| 01101111 | 00001100 00001010 0| 0000000 | NETWORK PORTION

| 01101111 | 00001100 00001010 0| 0000001 | FIRST HOST ADDRESS

| 01101111 | 00001100 00001010 0| 1111110 | LAST HOST ADDRESS

| 01101111 | 00001100 00001010 0| 1111111 | BROADCAST ADDRESS

Yes, The IP address 111. 12. 10. 4 is a valid host address because it does not fall into either network address or broadcast address. 18. 145. 192. 1/17

DOTTED DECIMAL REPRESENTATION

_____

| 18. 145. 192. 1 | IP ADDRESS_AND_ | 255. 255. 128. 0 | _ SUBNET MASK_____

| 18. 145. 128. 0 | NETWORK PORTION

| 18. 145. 128. 1 | FIRST HOST ADDRESS

| 18. 145. 255. 254 | LAST HOST ADDRESS

| 18. 145. 255. 255 | BROADCAST ADDRESS

BINARY REPRESENTATION

_NETWORK PART___SUBNET PART_____HOST PART_____ _____

| 00010100 | 10010001 1| 1000000 00000001 | IP ADDRESS_AND_ | 11111111 | 11111111 1| 0000000 00000000 | _SUBNET MASK_____

| 00010100 | 10010001 1| 0000000 00000000 | NETWORK PORTION

| 00010100 | 10010001 1| 0000000 00000001 | FIRST HOST ADDRESS

| 00010100 | 10010001 1| 1111111 11111110 | LAST HOST ADDRESS

| 00010100 | 10010001 1| 1111111 11111111 | BROADCAST ADDRESS

Yes, The IP addresses 18. 145. 192. 1is a valid host address because it does not fall into either network address or broadcast address. 125. 23. 13. 11/31We can not further subnet the subnetted IP address 125. 23. 13. 11/31 as we atleast require 2 bit to represent 4 hosts (i. e to assign IP address to 2 hosts and one for network and one for broadcast). 22. 0. 0. 2/9

DOTTED DECIMAL REPRESENTATION

_____

| 22. 0. 0. 2 | IP ADDRESS_AND_ | 255. 128. 0. 0 | _ SUBNET MASK_____

| 22. 0. 0. 0 | NETWORK PORTION

| 22. 0. 0. 1 | FIRST HOST ADDRESS

| 22. 127. 255. 254 | LAST HOST ADDRESS

| 22. 127. 255. 255 | BROADCAST ADDRESS

BINARY REPRESENTATION

_NETWORK PART___SUBNET PART_____HOST PART_____ _____

| 00010110 | 0| 0000000 00000000 00000010 | IP ADDRESS_AND_ |

11111111 | 1| 0000000 00000000 00000000 | _SUBNET MASK_____

| 00010110 | 0| 0000000 00000000 00000000 | NETWORK PORTION

| 00010110 | 0| 0000000 00000000 00000001 | FIRST HOST ADDRESS

| 00010110 | 0| 1111111 11111111 11111110 | LAST HOST ADDRESS

| 00010110 | 0| 1111111 11111111 11111111 | BROADCAST ADDRESS

Yes, The IP addresses 22. 0. 02 is a valid host address because it does not fall into either network address or broadcast address.

Question No. 10

What is the minimum and maximum number of subnet bits in a Class A address? Give the subnets of both cases.

Minimum Subnets from Class A Address 10. 128. 0. 1/9

CLASS A ADDRESS

NETWORK PORTION |-- SUBNET-- HOST PORTION

00001010 | 1| 0000000 00000000 0000000011111111 | 1| 0000000 00000000 00000000Number of Subnets = 2^ (subnet bits) = 2^1 = 2

SubnetsNumber of Usable Host ID = [2^ (host bits)] – 2 = (2^24) – 2 = 8388608-2 = 8388606 hosts / subnets

Maximum Subnets from Class A Address 10. 128. 192. 4/30

CLASS A ADDRESS

NETWORK PORTION |---------- SUBNET---------- | HOST PORTION

00001010 | 10000000 11000000 000001| 0011111111 | 11111111 11111111 111111| 00Number of Subnets = 2^ (subnet bits) = 2^22 = 4194304 SubnetsNumber of Usable Host ID = [2^ (host bits)] – 2 = (2^2) – 2 = 4-2 = 2 hosts / subnets

Question No. 10

Using the address 172. 16. 0. 0/16 assign subnet addresses to the network in the following figure. The serial links should be use masks of 30-bit length. Choose any mask length for the other networks. Network clouds are connected to each other by routers. 172. 16. 64. 0/1819111212221

172. 16. 128. 8/30

172. 16. 128. 16/30

172. 16. 128. 4/30

172. 16. 196. 0/22172. 16. 200. 0/22172. 16. 208. 0/22

172. 16. 216. 12/30

192. 16. 128. 20/30

172. 16. 216. 8/30

172. 16. 216. 4/30

172. 16. 216. 16/30

192. 16. 128. 24/30

172. 16. 199. 0/25172. 16. 198. 128/25172. 16. 198. 0/25172. 16. 197.

128/25172. 16. 197. 0/25172. 16. 196. 128/25