

# CS2105

## Tutorial 5

# Question 1

What is the 32-bit binary equivalent of the IP address 202.3.14.25?

202	3	14	25
<b>11001010</b>	<b>00000011</b>	<b>00001110</b>	<b>00011001</b>

**11001010.00000011.00001110.00011001**

## Question 2

- **[KR, Chapter 4, R25]** Suppose an application generates chunks of 40 bytes of data every 20 msec, and each chunk gets encapsulated in a TCP segment and then an IP datagram. Assume TCP header is 20 bytes and IP header is another 20 bytes, what percentage of each datagram will be overhead, and what percentage will be application data?
- **20 + 20 bytes of TCP + IP header**
- **40 bytes of data**
- **Total size is 80 bytes**
- **Thus, percentage of overhead and data is each 50%**

# Question 3

Combine the following three blocks of IP addresses into a single block:

- a) 16.27.24.0/26
- b) 16.27.24.64/26
- c) 16.27.24.128/25

- a) First addr: 00010000.00011011.00011000.00000000 Last addr : 00010000.00011011.00011000.00111111  
(16.27.24.0) ( 16.27.24.63)
- b) First addr: 00010000.00011011.00011000.01000000 Last addr : 00010000.00011011.00011000.01111111  
(16.27.24.64) (16.27.24.127)
- c) First addr: 00010000.00011011.00011000.10000000 Last addr : 00010000.00011011.00011000.11111111  
(16.27.24.128) (16.27.24.255)

Observation: b) continues a), and c) continues (b)

# Question 3

First addr: 00010000.00011011.00011000.00000000 Last addr : 00010000.00011011. 00011000.00111111  
(16.27.24.0) (16.27.24.63)

First addr: 00010000.00011011.00011000.01000000 Last addr : 00010000.00011011.00011000.01111111  
(16.27.24.64) (16.27.24.127)

First addr: 00010000.00011011.00011000.10000000 Last addr : 00010000.00011011.00011000.11111111  
(16.27.24.128) (16.27.24.255)

16.27.24.00000000 (BIN) to 16.27.24.11111111 (BIN)

Combine: 16.27.24.0 to 16.27.24.255 => 16.27.24.0/24

## Question 4

a) Consider a subnet with network prefix 192.168.56.128/26. Give an example IP address (of form xxx.xxx.xxx.xxx) that belongs to this network.

**Any IP address in the range 192.168.56.128 to 192.168.56.191**

**192.168.56.10000000 (BIN) to 192.168.56.10111111 (BIN)**  
**(192.168.56.128) (192.168.56.191)**

# Question 4

b) Suppose an ISP owns the block of addresses of the form 192.168.56.128/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the network prefixes (of form a.b.c.d/x) for the four subnets?

(Hint: 4 subnets: 2 bits to differentiate each subnet after 26 bits)

Network Prefix	Binary Expression

# Question 4

192.168.56.128/26 = 11000000 10101000 00111000 10000000

Network Prefix	Binary Expression
192.168.56.128/28	11000000 10101000 00111000 10 <u>00</u> 0000
192.168.56.144/28	11000000 10101000 00111000 10 <u>01</u> 0000
192.168.56.160/28	11000000 10101000 00111000 10 <u>10</u> 0000
192.168.56.176/28	11000000 10101000 00111000 10 <u>11</u> 0000

## Question 5

Consider a datagram network using 8-bit addresses. Suppose a router has the following forwarding table:

Prefix Match	Interface
11	0
101	1
100	2
otherwise	3

# Question 5

- For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

Prefix Match	Interface	IP Range	No. of IP
11	0		
101	1		
100	2		
otherwise	3		

## Question 5

Prefix Match	Interface	IP Range	No. of IP
11	0	<b>1100 0000</b> – <b>1111 1111</b>	<b>64</b> ( $2^6$ )
101	1	<b>1010 0000</b> – <b>1011 1111</b>	<b>32</b> ( $2^5$ )
100	2	<b>1000 0000</b> – <b>1001 1111</b>	<b>32</b> ( $2^5$ )
otherwise	3	<b>0000 0000</b> – <b>0111 1111</b>	<b>128</b> ( $2^7$ )

# Question 6

What is private IP address?

<https://tools.ietf.org/html/rfc1918>

The Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of IP address space for private networks:

10.0.0.0	- 10.255.255.255	(10/8 prefix)
172.16.0.0	- 172.31.255.255	(172.16/12 prefix)
192.168.0.0	- 192.168.255.255	(192.168/16 prefix)

Does Canvas use private or public IP?

Canvas use public IP address (e.g., 52.76.116.16). (use ping command to check it)

When your laptop is connected to NUS network, does it receive a private or public IP?

Laptops of students are assigned private IP addresses (e.g., 172.29.234.131).