

National University of Singapore  
School of Computing

CS2105

**Tutorial 5**

Question paper

192 No

1. [KR, Chapter 4, R13] What is the 32-bit binary equivalent of the IP address 202.3.14.25?

$\begin{array}{cccccccc} 128 & 64 & 32 & 16 & 8 & 4 & 2 & 1 \\ 1 & 1 & 0 & 0 & 1 & 0 & 1 & 0 \end{array}$ 
 $11001010 \cdot 00000011 \cdot 00001110 \cdot 00011001$

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?

50% overhead.      50% application data.

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

a)  $\frac{8 \times 8 \times 8 \times 8}{8 \times 3} 16.27.24.0/26 = 24 + 2$   
 b)  $16.27.24.64/26$   
 c)  $16.27.24.128/25$

}  $16.27.24.0/24$

4. [Modified from KR, Chapter 4, P16]

- 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.

$192.168.56.129/26$

- 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?

Network Prefix	Binary Expression
$192.168.56.128/28$	$11000000 \cdot 10101000 \cdot 00111000 \cdot \underline{10000000}$
$192.168.56.144/28$	$11000000 \cdot 10101000 \cdot 00111000 \cdot \underline{10010000}$
$192.168.56.160/28$	$11000000 \cdot 10101000 \cdot 00111000 \cdot \underline{10100000}$
$192.168.56.176/28$	$11000000 \cdot 10101000 \cdot 00111000 \cdot \underline{10110000}$

5. [KR, Chapter 4, P7] 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

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	<u>11000000</u> - <u>11111111</u> ✓	$2^6 = 32$ 64
101	1	<u>10100000</u> - <u>10111111</u> ✓	$2^5 = 16$ 32 ?
100	2	<u>10000000</u> - <u>10011111</u> ✓	$2^5 = 16$ 32 ?
otherwise	3	<u>00000000</u> - <u>11111111</u> ✓	$2^8 - 2^6 - 2 \cdot 2^5 = 64$ 128

Largest prefix match → beware of range! (can split into 2 diff ranges).

6. What is private IP address? Does LumiNUS use private or public IP? When your laptop is connected to NUS network, does it receive a private or public IP?

Set of reserved IP addresses, for subnets only, not directly addressable from wider internet.

Private IP: ~~IP that can be used by anyone and is not officially registered with ICANN~~

LumiNus uses public IP. 137.132.7.240

Laptop uses private IP. ✓