南京工业大学 计算机网络 试题（A）卷（闭）

2022 - 2023 学年第二学期 使用班级 计 2001~06，智 2001-02

班级： 学号： 姓名：

课程目标	课程目标 1（30）		课程目标 2（20）	课程目标 3（24）		课程目标 4（26）		总分
题号	I	II	III	IV	V	VI	VII	
分数								

NOTE: *This is a CLOSED BOOK, 120-minute exam. NO textbooks, NO electronic products such as mobile phones are allowed. You are encouraged to WRITE YOUR ANSWERS IN ENGLISH. Thank you!*

课程目标 1 题目：

I. (10 Marks)

According to Nyquist's theorem 尼奎斯特定理, if an arbitrary signal has been run through a low-pass filter of bandwidth H,the filtered signal can be completely reconstructed by making only $2H$ (exact) samples per second. That is,

Max data rate: $R_{\max} = 2H \log_2 V$ bits/sec

If the bandwidth of a channel is 3100Hz and we are using 16 level modulation, what is the maximum number of bit we could transmit?

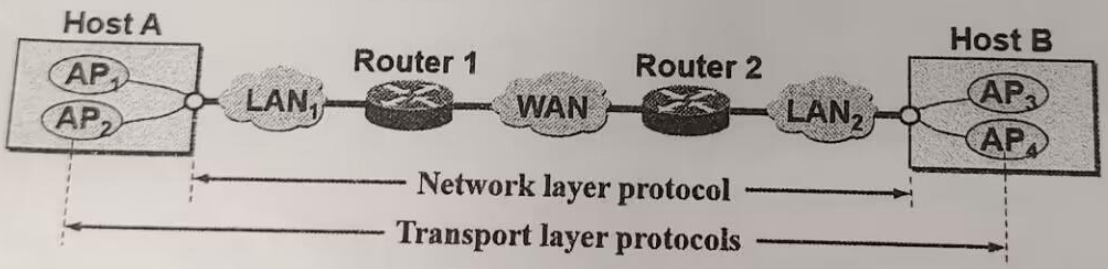
根据尼奎斯特定理，如果一个任意的信号通过带宽为 H 的低通过滤器，被过滤的信号只需每秒 2H 次精确采样就可以完全被重构。

$2 \times 3100 \times \log_2 16$

II (20 Marks) Transmission Control Protocol (TCP) issues

(1) (*10 Marks*) Please describe the TCP Connection Establishment process (*Three way handshake*). 请描述TCP连接建立过程.(三次握手)

(2) (*10 Marks*) A network scenario is shown in the following figure. Please describe the main functional differences between the transport layer and the network layer. 一个网络场景如下图所示..请描述网络层和传输层的主要功能差异



课程目标 2 题目：

III (20 Marks) As shown in Figure 1, LAN_1, LAN_2 and LAN_3 are interconnected by $Router_1$ and $Router_2$, with

Subnet mask(子网掩码): 255.255.255.0.

Network address: LAN_1: 222.1.1.0 LAN_2: 222.1.2.0 LAN3: 222.1.3.0

IP address: IP_1: 222.1.1.1 IP_2: 222.1.3.2 IP_3: 222.1.1.2
IP_4: 222.1.2.1 IP_5: 222.1.2.2 IP_6: 222.1.3.1

MAC address: HA_1: 00:D0:C9:35:56:11 HA_2: 00:D0:C9:30:55:35
HA_3: 00:D0:C9:35:22:55 HA_4: 00:D0:C9:40:58:90
HA_5: 00:D0:C9:40:22:55 HA_6: 00:D0:C9:30:22:55

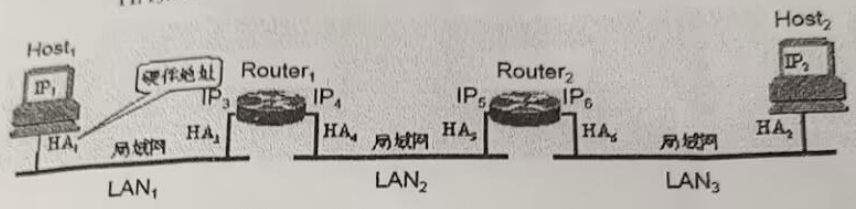


Figure 1 A network scenario

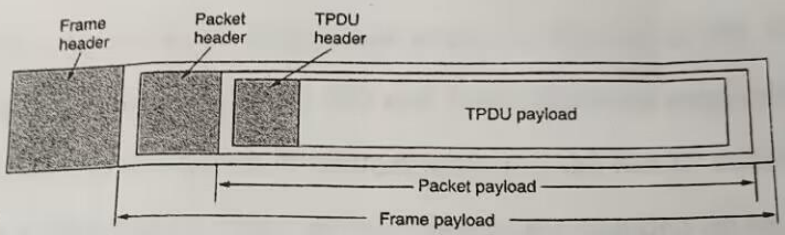


Figure 2: a Frame captured by LAN_2

(1) (8 Marks) Suppose that $Host_1$ sends an IP packet to $Host_2$, and we capture(捕获) a Frame from the data link layer at LAN_2, shown by Figure 1, please determine:

- the source MAC address and destination MAC address in the Frame header (Figure 2);
- the source IP address and destination IP address in the Packet header (Figure 2).

(2) (12 Marks) Please configure the routing table for $Router_1$ and $Router_2$ manually, in order that they can route packets to any network of LAN_1, LAN_2 and LAN_3.

$Router_1$:

Destination Network	Subnet Masks	Next Hop

$Router_2$:

Destination Network	Subnet Masks	Next Hop

课程目标 3 题目：

IV. (14 Marks) Subnet masks indicates which part of a 32-bit IP address represents Net-id and Subnet-id. Now we have an IP address of 130.97.17.132 with a subnet mask of 255.255.254.0, please determine the "*Net-id and Subnet-id*" and "*Host-id*" respectively.

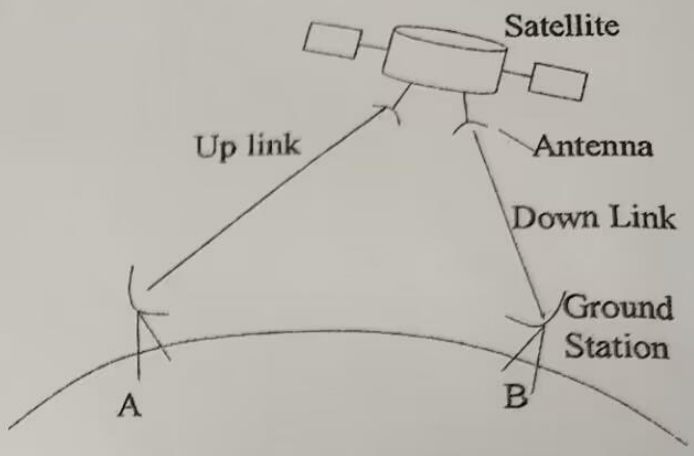
V. (10 Marks)

A large number of consecutive IP address are available starting at 192.168.0.0. Suppose that two organizations, *A* and *B*, request 500 and 1000 addresses respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the w.x.y.z/s notation (Note: all the requests are rounded up to a power of two).

课程目标 4 题目：

VI (16 Marks)

There are two hosts, A and B, which communicate using a satellite link with the bit rate of 64 kbps and the signal round-trip propagation delay is 480ms. Now Host A wants to transfer a series of data frames with length of 128 bytes to Host B. On receiving a data frame, Host B always replies an ACK with length of 64 bytes.



(1) *(8 Marks)* What is the utilization of link A→B, if Host A uses *stop-and-wait protocol*?

(2) *(8 Marks)* If Host A uses *sliding window protocol* to send enough frames to keep the link working at full capacity, how many bits should be used for frame sequence numbers? What is the maximum utilization of link A→B which can be reached?

VII. (10 Marks)

A local area network uses CSMA/CD protocol to achieve Medium access control. The data transmission rate (bandwidth) is 10Mbps, the distance between host A and host B is 2000m, and the signal propagation speed in medium is 2×10^8m/s. If there is a conflict between host A and host B when sending data, how long does it take from the time of sending data to the time when both hosts detect the conflict? Please describe the situation of the shortest and longest conflict detection time, and calculate both the shortest and the longest time.