南京工业大学 计算机网络 试题（A）卷（闭）

2019 - 2020 学年第二学期 使用班级 计 1701、1702、1703、1704

班级：　　　　　　学号：　　　　　　姓名：

题号	1	2	3	4	5	6	7	附加分	总分
得分									

重要说明：（1）答题时请将答案写在单独的答题纸上，答题纸每一页最上面一行写清楚"班级、学号、姓名"，答题时务必注明题号，例如 1，1.1 "答案"；1.2 "答案"；……；（2）考试结束后，在线参加考试的同学请将每一页答题纸用手机拍照（拍摄字迹清晰，光线明亮），并将多页照片按顺序放在一个 WORD 文件里面（以自己的"班级+学号+姓名"命名，例如：计 170101 张三），上传到超星学习通；（3）答题可以用中文或英文。如果采用英文答题，可获得 1~5 分的附加分。

1. Multiple Choice (20 Marks)

Please choose the best answer for each of the following 10 questions.

1.1 According to the OSI model, which layer is responsible for route selection(路由选择) for packets from the source machine to the destination machine.

　　(A) Physical layer.　　　　　　(B) Data link layer.

　　(C) Network layer.　　　　　　 (D) Transport layer.

1.2 The range of frequencies transmitted without being strongly attenuated(衰减) is

　　(A) bandwidth　　　　　　　　(B) wavelength

　　(C) phase difference　　　　　　(D) Signal-to-Noise Ratio

1.3 According to Nyquist's theorem(尼奎斯特定理), the analog signals(模拟信号) from the 4000Hz channel bandwidth are digitized by a codec by making

　　(A) 1000 samples per second.　　　(B) 2000samples per second.

　　(C) 4000 samples per second.　　　(D) 8000 samples per second.

1.4 A protocol in the Data Link Layer, which is used to limit the maximum number of frames sent by sender without waiting for acknowledgement, is

　　(A) The Point-to-Point Protocol (PPP)　　　(B) The sliding window protocol

(C) CSMA/CA Protocol   (D) CSMA/CD Protocol

1.5 On an IEEE802.3 Ethernet, when a station has data to send, it first competes the shared channel using

        (A) Slotted ALOHA   (B) CSMA/CA

        (C) CSMA/CD   (D) Stop and Wait Protocol

1.6 The Transmission Control Protocol (TCP) is

        (A) a connectionless transport layer protocol

        (B) a connection-oriented transport layer protocol

        (C) a connectionless network layer protocol

        (D) a connection-oriented network layer protocol

1.7 Which kind of delay in a packet-switched network depends on congestion（拥塞）level of router

        (A) Queueing delay   (B) Transmission delay

        (C) Propagation delay   (D) Nodal processing delay

1.8 In Infrastructure BSS of WLAN, all frames are relayed between stations by

        (A) Hub   (B) Access Point (AP)   (C) Repeater   (D) Bridge

1.9 A TCP connection between client and server will be established by using

        (A) Three-way handshake mechanism

        (B) TCP Congestion Control mechanism

        (C) TCP Flow Control mechanism

        (D) TCP Error Control mechanism
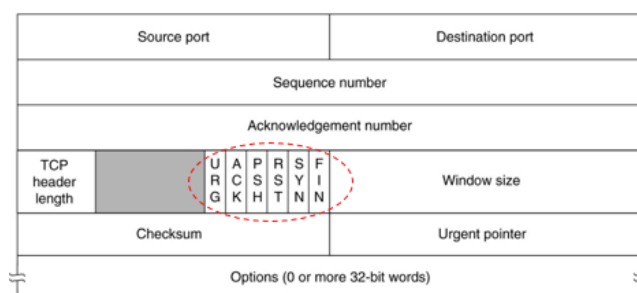
1.10 When a client wants to initiate TCP connection, it firstly sends a TCP segment (Figure 1) to server with

        (A) URG=1

        (B) ACK=1

        (C) SYN=1

        (D) FIN=1

Figure 1 The TCP Header

2. (10 Marks) A TCP connection is established between two hosts, with 1KB MSS, a 64KB buffer at Host B and RTT of *2ms*. The TCP send window (W) grows exponentially(指数形式的增长), as shown in Figure 2. How long will it take, when W reaches 32KB (threshold)? Please explain the window change process.
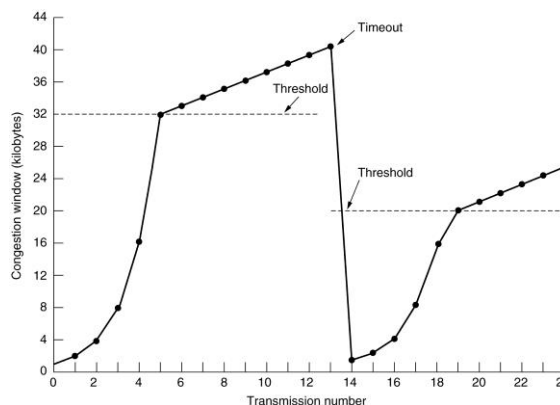

Figure 2 TCP Congestion Control

3. (20 Marks) As shown in Figure 3, LAN₁, LAN₂ and LAN₃ are interconnected by Router₁ and Router₂, 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

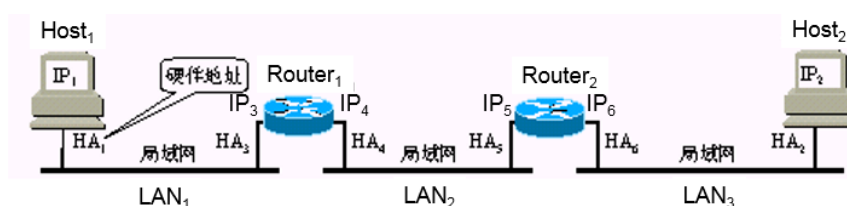HA$_5$: 00:D0:C9:40:22:55   HA$_6$: 00:D0:C9:30:22:55
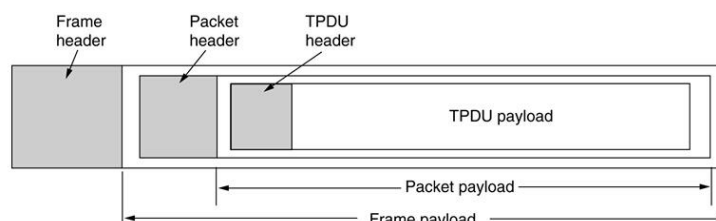

Figure 3

Figure 4: a Frame captured by LAN₂

3.1 Suppose that Host₁ sends an IP packet to Host₂, and we capture(捕获) a Frame

from the data link layer at LAN₂, shown by Figure 3, please determine:

- **the source MAC address and destination MAC address in the Frame header (Figure 4);**

- **the source IP address and destination IP address in the Packet header (Figure 4).**

3.2 Please configure the routing table for Router₁ and Router₂ manually, in order that they can route packets to any network of LAN₁, LAN₂ and LAN₃.（答题时，请将下面的路由表画在答题纸上）

Router₁:

Destination Network	Subnet Masks	Next Hop

Router₂:

Destination Network	Subnet Masks	Next Hop

4. (9 *Marks*) Suppose that we have a campus network with IP address space of 128.14.46.34/20. Now we want to divide the campus network into 30 subnets for various departments.

4.1 How many bits we need to take from the host number part to create a "subnet" number?

4.2 Please determine the subnet masks.

4.3 How many IP addresses are available in each subnet?

5. (16 Marks) A large number of consecutive IP address are available starting at 192.168.0.0. Suppose that four organizations A, B, C, and D request 500, 1000, 2000, and 500 addresses respectively. If we want the maximum utilization of address space (最大化地址空间的利用率), please assign addresses for these organizations, and 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).

6. (10 Marks) An Ethernet consists of 5 segments connected by 4 repeaters(中继器).

- ✧ **Each segment is 500 meter long.**
- ✧ **The signal propagation speed（信号传播速度）is 2×10^8 m/sec.**
- ✧ **The delay caused by each repeater is 2.5 μsec.**
- ✧ **The transmission rate (bandwidth 带宽) is 10 Mbps.**

Now we have two hosts, say *A* and *B*, which are located at far ends of the LAN.

6.1 Please calculate the signal propagation delay from Host *A* to *B*.

6.2 When hosts compete the shared the channel using CSMA/CD, please calculate the minimum frame size (in bit) for any sending host to detect the collision.

7. (15 Marks) There are two hosts, A and B, which communicate using a satellite link (卫星链路) with the bit rate of 64 kbps and the signal round-trip propagation delay(信号往返传播时延) 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.

7.1 What is the utilization（利用率）of link A→B, if Host A uses *stop and wait protocol*?

7.2 If Host A uses *sliding window protocol*(滑动窗口协议) to send enough frames to keep the link working at full capacity, how many bits should be used for frame sequence numbers(帧序号)? What is the maximum utilization of link A→B (最大链路利用率) which can be reached?