装 订 线

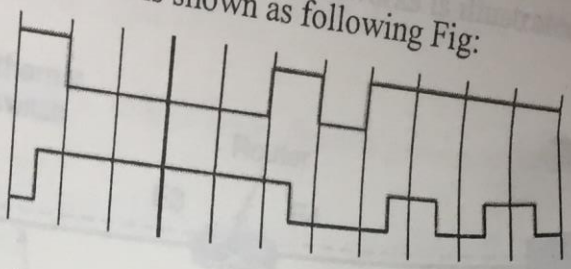
成绩

I. Fill in the blanks

(1) A example of digital modulation is shown as following Fig:

Non-Return to Zero (NRZ)

NRZ Invert (NRZI)



These signals represent bit stream 10000101111.

(2) Shannon's major result is that the maximum data rate of a noisy channel whose bandwidth is H Hz, and whose signal-to-noise ratio is S/N, is given by H log$_2$(1+S/N).

(3) Suppose sending an x-bit message over a k-hop path in a (lightly loaded) packet-switched network. The propagation delay is d sec per hop, the packet size is p bits, and the data rate is b bps. The total delay is $\frac{P}{b}\cdot(k-1)+kd+\frac{x}{b}$.

(4) Suppose go-back-N protocol uses 4-bit sequence number, the maximum windows size is $2^4-1=15$.

(5) Consider sending a 4000-byte IP datagram packet (header length is 20 bytes) into a link that has an MTU of 1500 bytes. The fragment offset fields of the IP header in first packet transmitted over the link is 0.

(6) Suppose RIP routing protocol is used in the subnet, router D's routing table has a record, Dest. Network is Z, Next hop is B, Num. of Hops is 7. Now router D receives routing information from router A, Dest. Network is Z, Next hop is C, Num. of Hops is 4. Now D's new routing table: Dest. Network is Z, Next hop is A, Num. of Hops is 5.

(7) A router has just received the following new IP addresses: 57.6.96.0/21, 57.6.104.0/21, 57.6.112.0/21, and 57.6.120.0/21. If all of them use the same outgoing line, they be aggregated 57.6.96.0/19.

(8) Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number is 110. Suppose that the first segment is lost but the second segment arrives at B. In the acknowledgment that Host B sends to host A, the acknowledgment number is 90.

(9) IP loopback address is 127.0.0.1.

(10) The IP addresses of a subnet arrange from 61.8.0.1 to 61.15.255.254, its subnet mask is 255.248.

(10 points) Select the most appropriate answer

(1) A network uses a signaling speed of 25MHz and requires three twisted pairs. On each twisted pair it sends ternary digits with three different voltage levels. The bit rate of this network is _____.

A. 25Mbps B. 50Mbps C. 75Mbps D. 100Mbps

(2) What are the advantages of packet switching over circuit switching? _____

A. Less wasteful in case of bursty traffic

B. Less wasteful in case of steady traffic

C. Easier to implement on network devices

D. Allows for lower delays

(3) Suppose you are designing a sliding window protocol for a 1-Mbps point-to-point link to the moon, which has a one-way latency of 1.25 seconds. Assuming that each frame carries 1 KB of data, what is the minimum number of bits you need for the sequence number? _____.

A. 6 B.7 C. 8 D. 9

(4) Suppose selective repeat protocol uses 3-bit sequence number. If receiving window size is 3, the maximum size of sending window is _____.

A. 5 B. 6 C. 7 D. 8

(5) The MAC protocol for Ethernet is _____.

A. CSMA/CD B. Token Bus

C. Token Ring D. MACA/MACAW

(6) In a switched network, the number of collision domains is _____ the number of broadcast domains.

A = B. < C. > D. none of above

(7) A router has two processes inside it. One of them is responsible for filling in and updating the routing tables. This process is _____.

A. routing B. forwarding C. processing D. queuing

(8) _____ solves the problem of finding out which Ethernet address corresponds to a given IP address.

A. ARP B. RARP

C. BOOTP D. DHCP

(9) In TCP protocol, the number of bytes that may be sent is _____.

A. receiving window

B. congestion window

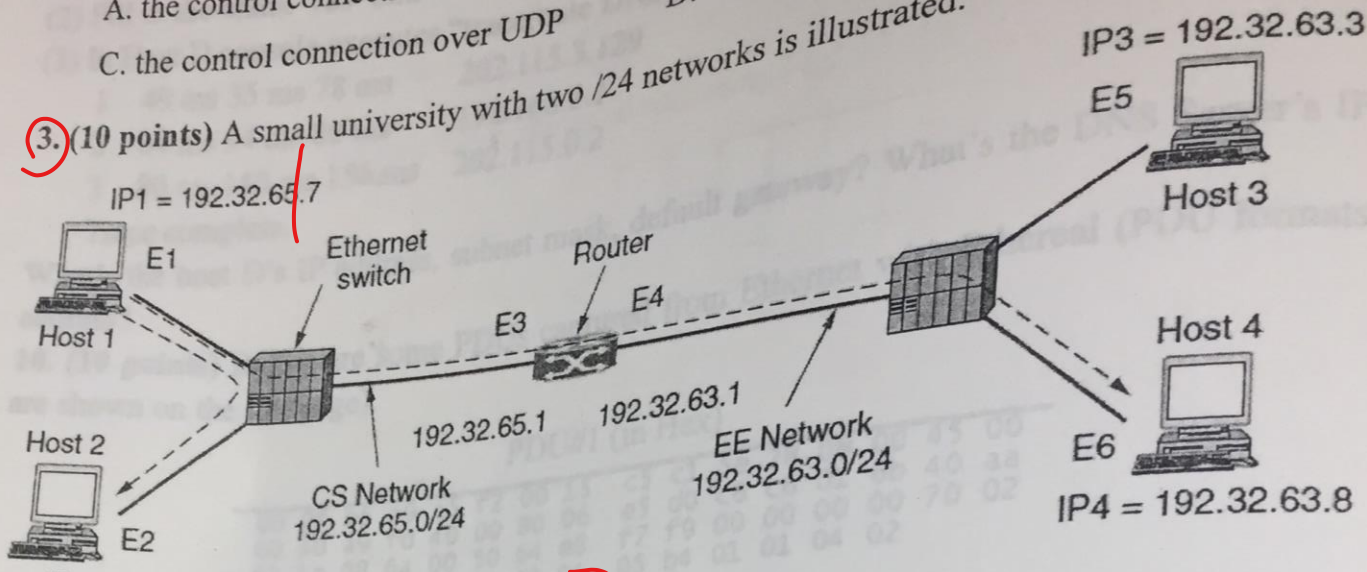
C. the minimum of the above two windows

(10) Which of the following

A. the control connection over TCP B. the data connection over TCP

C. the control connection over UDP D. the data connection over UDP

3. **(10 points)** A small university with two /24 networks is illustrated.



(1) Please fill in the following table

Frame	Source IP	Source Eth.	Destination IP	Destination Eth.
Host 1 to 2, on CS net	ZP1	E1	ZP2	E2
Host 1 to 4, on CS net	ZP1	E1	ZP4	E3
Host 1 to 4, on EE net	192.32.63.1	E4	ZP4	E6

(2) What's the default gateway of Host 1 and Host2? 192.32.65.1

(3) Suppose the router is enabled proxy ARP, Host 4 broadcast ARP request to resolve Host 1's Ethernet address. Host 4 will receive the arp response. What's the Ethernet address through ARP resolution? E4

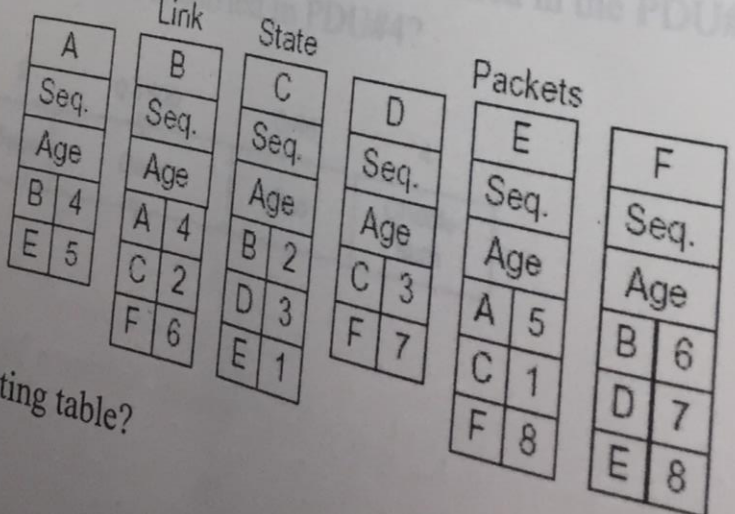
4. (10 points) In a CSMA/CD network with a data rate of 10 Mbps, the maximum distance between any station pair is found to be 2500 m for the correct operation of the collision detection process. What should be the maximum distance if we increase the data rate to 100 Mbps? To 1 Gbps? To 10 Gbps?

5. (10 points) Stop-and-Wait (SAW) is a simple protocol for reliable delivery of packets from source to destination. Answer the following questions regarding SAW.

(1) Sketch the timing diagram for SAW showing both error free and data packet loss cases.

(2) Identify all the delay components of SAW.

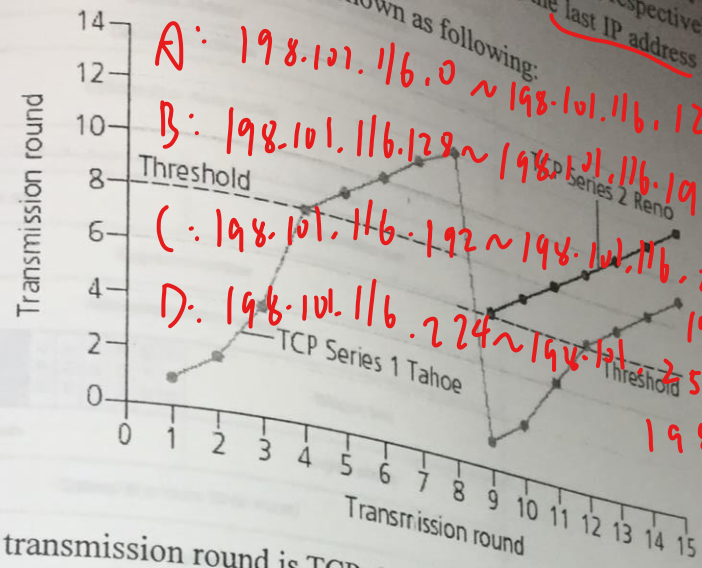
6.(10 points) Suppose OSPF routing protocol is used in the subnet, The link state packets(LSPs) for this subnet are shown as follow:



What is router B's routing table?

7. **(10 points)** A IP address block is available at 198.101.116.0/24. Suppose that four departments, A, B, C, and D, request 120, 60, 26, and 25 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.

8. **(10 points)** TCP congestion control is shown as following:



(1) During what transmission round is TCP slow start operating in TCP Tahoe?

(2) During what transmission round is TCP congestion avoidance operating in TCP Tahoe?

(3) After the 8th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout in TCP Tahoe?

(4) After the 8th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout in TCP Reno?

(5) What is the initial value of Threshold at the first transmission round?

(6) What is the value of Threshold at the 9th transmission round?

(7) During what transmission round is the 18th segment sent?

(8) Assuming a packet loss is detected after the 8 round by the receipt of a triple duplicate ACK, then in 15th round a packet loss is detected by the receipt of a triple duplicate ACK again. What will be the values of the congestion window size and of Threshold?

9. **(10 Points)** A campus network has public IP address block: 202.115.0.0/24~202.115.3.0/24. This intranet has four routers (R1,R2,R3,R4), Web server's IP address is 202.115.0.10.

R2's Routing Table

Destination Network/Prefix	Next Hop	Interface
192.168.0.0/24	192.168.2.1	S0
192.168.1.0/24	192.168.2.1	S0
192.168.2.0/24	direct	S0
202.115.0.0/24	192.168.2.1	S0
202.115.1.0/24	192.168.2.1	S0
202.115.2.0/24	192.168.2.1	S0
202.115.3.0/26	direct	FastEthernet1
202.115.3.64/26	direct	FastEthernet2
202.115.3.128/26	direct	FastEthernet3

R1's Routing Table

Destination Network/Prefix	Next Hop	Interface
192.168.0.0/24	direct	S2
192.168.1.0/24	direct	S3
192.168.2.0/24	direct	S1
	direct	FastEthernet0

(a)

202.115.1.0/24	192.168.0.254	S2
202.115.2.0/24	192.168.1.254	S3
202.115.3.0/24	192.168.2.254	S1

Please answer the following questions:

(1) Draw topology map and write each subnet of all routers.

(2) Fill in the blank (a) and (b) in R1's Routing Table.

(3) In Host D console executes "traceroute DNS Server IP" command:

```
1   49 ms 35 ms 78 ms     202.115.3.129
2   64 ms 94 ms 80 ms     192.168.2.1
3   80 ms 140 ms 156 ms   202.115.0.2
Trace complete.
```

What's the host D's IP address, subnet mask, default gateway? What's the DNS Server's IP address?

10. **(10 points)** Below are some PDUs captured from Ethernet with Ethereal (PDU formats are shown on the last page).

PDU#1 (in Hex)

```
00 0f b5 a9 a5 f2 00 15  c5 c1 5e 28 08 00 45 00
00 30 a9 fd 40 00 80 06  e5 d0 c6 c6 01 6b 40 aa
62 1e 08 6a 00 50 64 e8  f7 f9 00 00 00 00 70 02
ff ff b2 89 00 00 02 04  05 b4 01 01 04 02
```

PDU#2 (in Hex)

```
00 15 c5 c1 5e 28 00 0f  b5 a9 a5 f2 08 00 45 00
00 30 27 45 40 00 3f 06  a9 89 40 aa 62 1e c6 c6
01 6b 00 50 08 6a e7 d6  76 36 64 e8 f7 fa 70 12
16 d0 3d cb 00 00 02 04  05 84 01 01 04 02
```

PDU#3 (in Hex)

```
00 0f b5 a9 a5 f2 00 15  c5 c1 5e 28 08 00 45 00
00 28 a9 ff 40 00 80 06  e5 d6 c6 c6 01 6b 40 aa
62 1e 08 6a 00 50 64 e8  f7 fa e7 d6 76 37 50 10
ff ff 6b 14 00 00
```

PDU#4 (in Hex)

```
00 0f b5 a9 a5 f2 00 15  c5 c1 5e 28 08 00 45 00
01 61 aa 00 40 00 80 06  e4 9c c6 c6 01 6b 40 aa
62 1e 08 6a 00 50 64 e8  f7 fa e7 d6 76 37 50 18
ff ff 6c 4d 00 00 47 45  54 20 2f 72 66 63 2e 68
74 6d 6c 20 48 54 54 50  2f 31 2e 31 0d 0a 41 63
```

Please answer the following questions:

(1). What is the source MAC address in PDU#1 (in Hex)?

(2). What is the destination IP address in PDU#1 (in Decimal)?

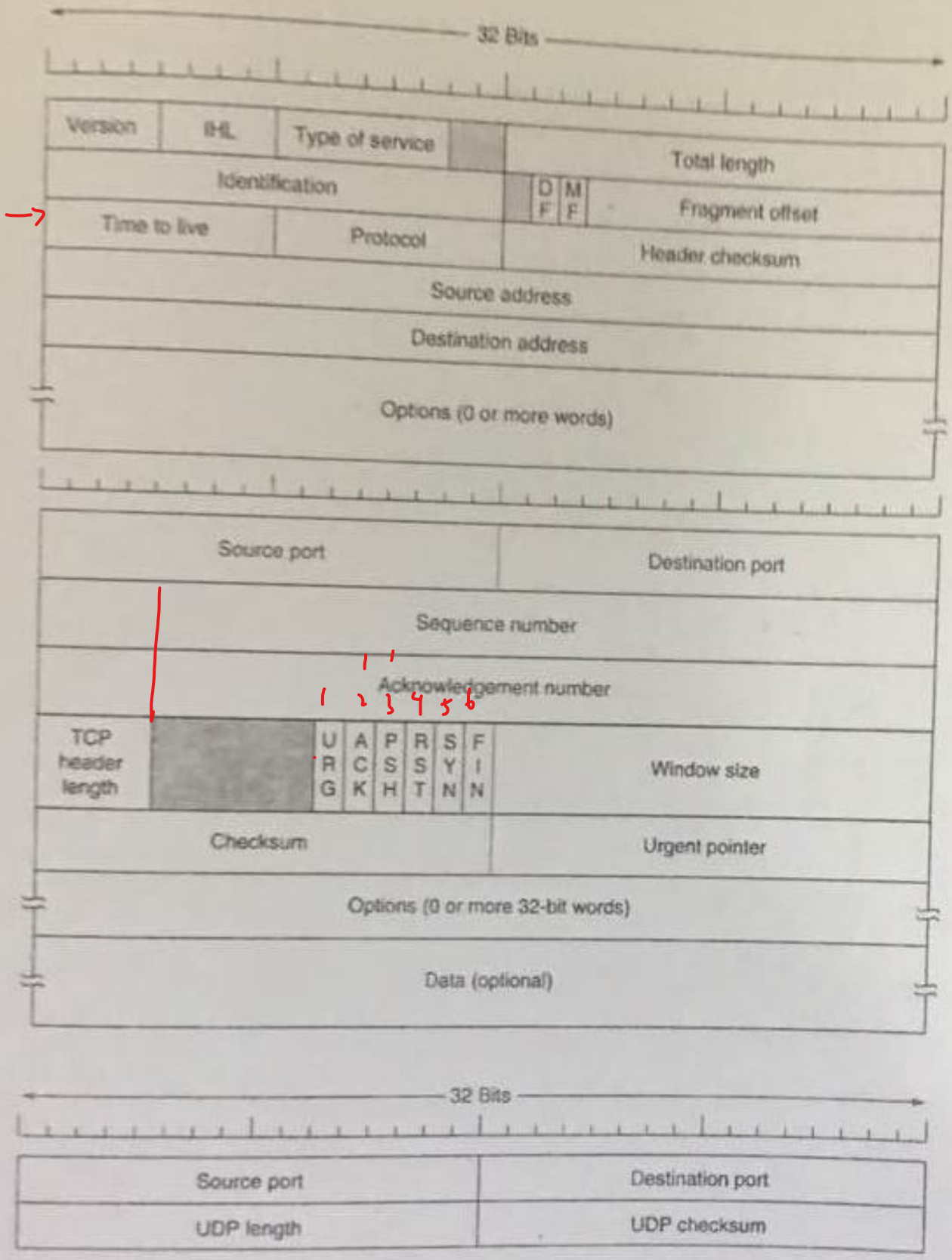
(3). What is the destination port number of transport layer in PDU#1 (in Decimal)?

(4). What kind of transport layer protocol is carried in the PDU#1, PDU#2,PDU#3?

(5). What is the purpose of transport layer protocol carried in the PDU#1, PDU#2,PDU#3?

(6). What application protocol is carried in PDU#4?

6	6	2	0-1500	0-46	4
Destination address	Source address	Type	Data	Pad	Check-sum


32 Bits
Version
IHL
Type of service
Total length
Identification
DF
MF
Fragment offset
Time to live
Protocol
Header checksum
Source address
Destination address
Options (0 or more words)
Source port
Destination port
Sequence number
Acknowledgement number
TCP header length
URG
ACK
PSH
RST
SYN
FIN
Window size
Checksum
Urgent pointer
Options (0 or more 32-bit words)
Data (optional)
32 Bits
Source port
Destination port
UDP length
UDP checksum