南京工业大学 计算机网络 试题（ A ）卷（闭）

2021 - 2022 学年第二学期　使用班级　计 1901~10

班级:　　学号:　　姓名:

课程目标	课程目标 1		课程目标 2		课程目标 3		课程目标 4		
题号	I	II	III	IV	V	VI	VII	VIII	总分
分数									

NOTE: *This is a CLOSED BOOK, 120-minute exam. No textbooks, notes or dictionaries are allowed. It consists of eight problems with a total of 100 marks. You are encouraged to WRITE YOUR ANSWERS IN ENGLISH. Thank you, and Good luck!*

课程目标 1 题目： 物理层

I. (5 Marks) If the data transmission rate (bit rate) of a communication link is 7200 bps and 8-phase modulation (8 相位调制) is used, please calculate the baud rate (波特率) of the link. Please explain the reason.

比特率：每秒传输的比特数

单位时间传输的码元个数

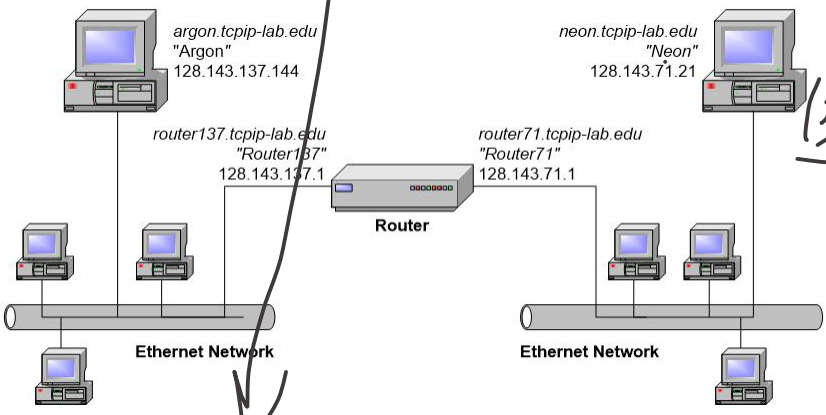
$\log_2 8 = 3$：每个码元可携带3bit信息

$7200 \div 3 = 2400$

$1600 \times 3 = 4800$ bit

$\log_2 2 = 1$　　$4800 \div 1 = 4800$

II. (15 Marks) We have a network scenario as follows. If *Argon* wants to send a packet to *Neon* with host name of "neon.tcpip-lab.edu", (1) how *Argon* finds the numeric IP Address of *Neon*'s host? (2) how to determine whether the destination host is in the local network? (3) how to determine the MAC address of his default gateway?



(1) DNS 域名解析

(2) 查路由表

(3) ARP 协议.

课程目标 2 题目： 物理层

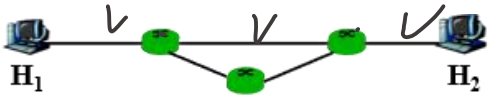
III (5 Marks) According to Nyquist's theorem (尼奎斯特定理),

$$R_{\max} = 2H \log_2 V$$

if the bandwidth is 4000Hz and we are using 8 level modulation. What is the maximum data rate (bps) we could transmit?

$2 \times 4000 \times 3 = \cdots$

IV. (10 Marks) In the "store-and-forward" packet switching network shown in the figure below, the data transmission rate of all links is 100Mbps, the packet size is 520 bytes, and the packet header size is 20 bytes. If host *H1* sends a 500 KB file to host *H2*, what is the minimum file transfer time? (For simplicity, packet disassembly time and propagation delay are ignored.) 链路层



$\frac{500\text{K}}{500}$

$X = 500 \times 1024 \times 8$

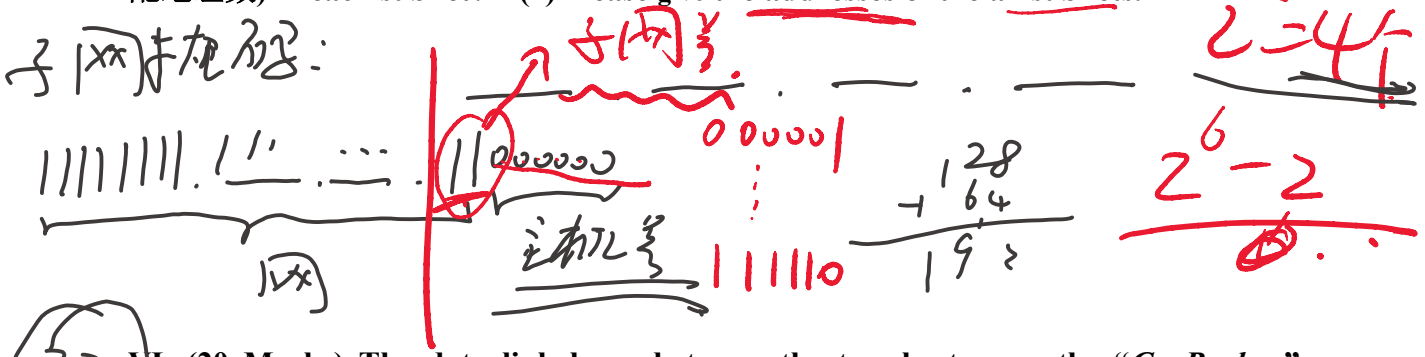
$\frac{(k-1)p}{b}$

$\frac{X}{b} = \frac{500 \times 1024 \times 8}{100 \times 10^6} + \frac{2 \times 1024}{100 \times 10^6}$

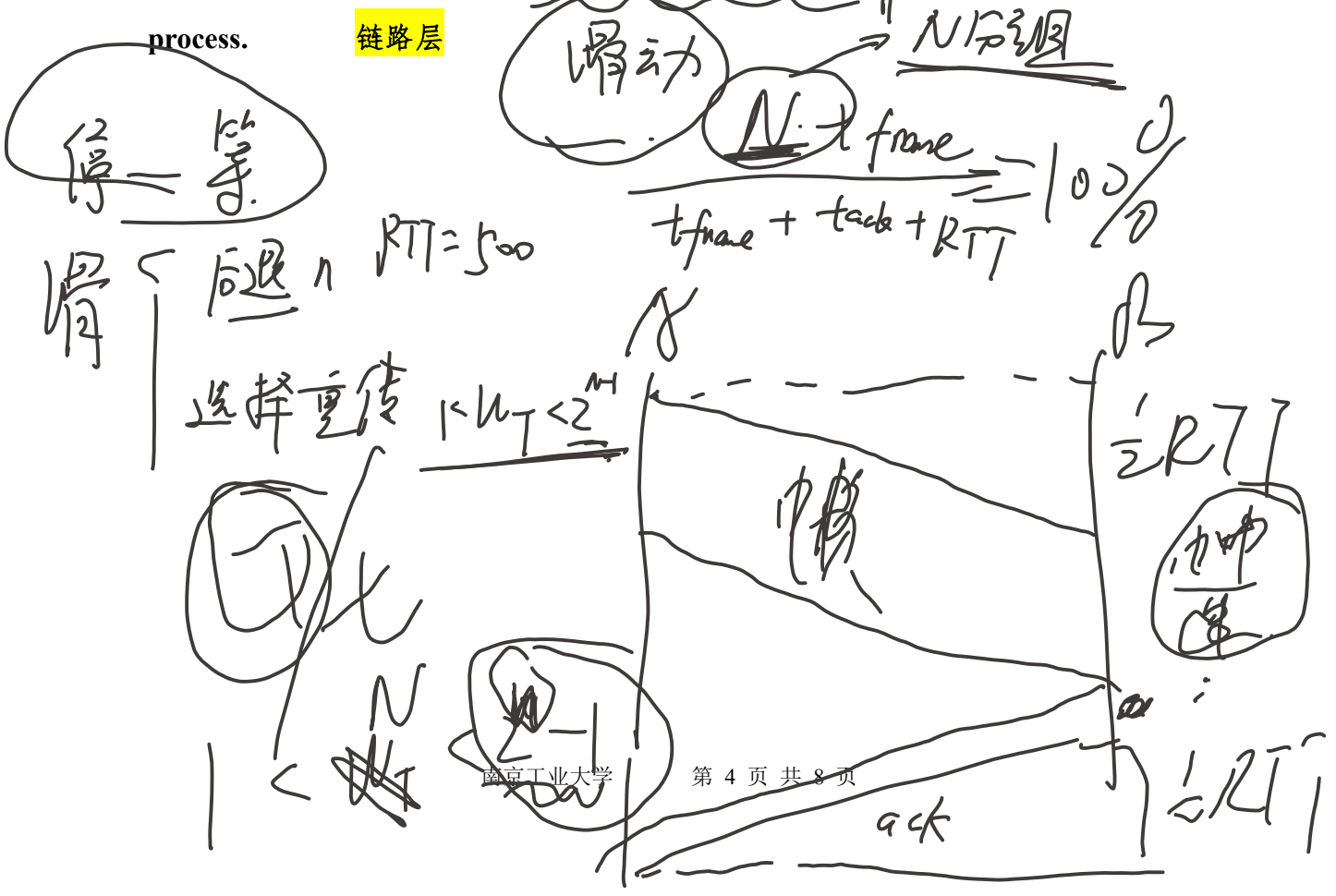
$\frac{X}{b} + kd + \frac{(k-1)p}{b}$

课程目标 3 题目： 网络层

V. (10 Marks) The IP address space of a network is 198.16.16.0/24, which is divided by fixed length subnet, and the subnet mask is 255.255.255.192. (1) What are the maximum number of subnets and the maximum number of allocable addresses (可分配地址数) in each subnet? (2) Please give the addresses of the all subnets.

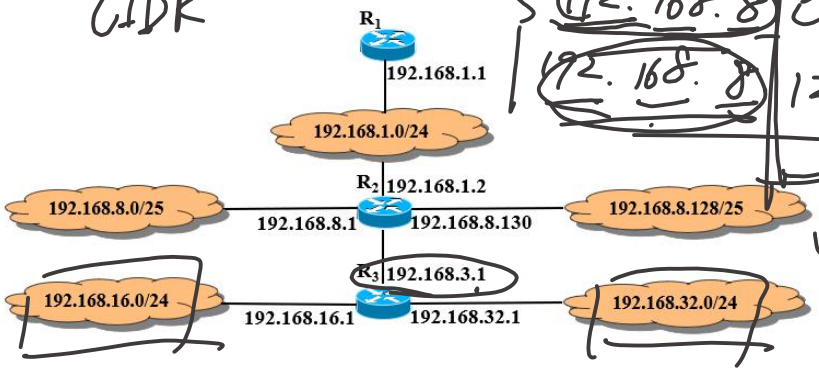


VI. (20 Marks) The data link layer between the two hosts uses the "*Go Back n*" protocol(后退 N 帧协议) to transmit data. The data transmission rate is 16kbps, the round-trip propagation delay is 500ms, and the data frame size varies between 64 and 1518 bytes. The receiver always acknowledges with shortest Ethernet frame (64 Bytes). What is the minimum number of bits in the frame sequence number to maximize channel utilization (为了最大化信道利用率)? Please give the calculation process. 链路层



课程目标 4 题目： 网络层

VII. (15 Marks) A network topology is shown in the figure below. Router R_1 only has routes to subnet 192.168.1.0/24. To enable R_1 and R_2 to correctly route IP packets to all subnets in the figure, please add routing table entries in R_1, and R_2, including the destination network, subnet mask, and next hop. (You can use route aggregation if possible.)



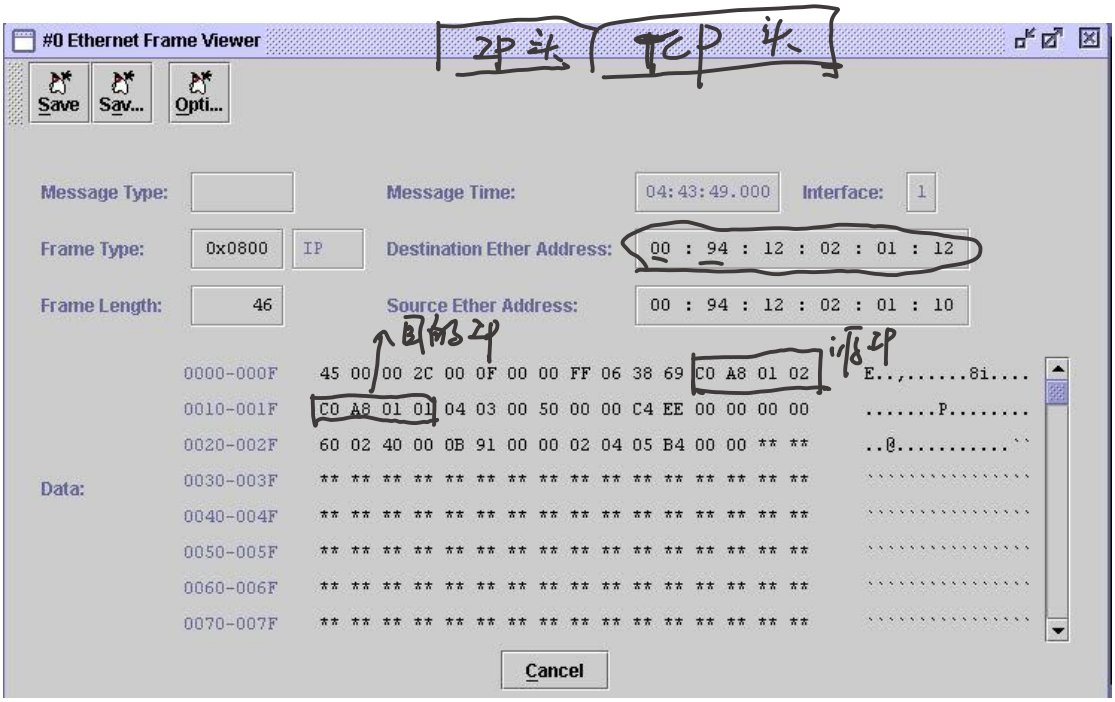
R_1

destination network	subnet mask	next hop

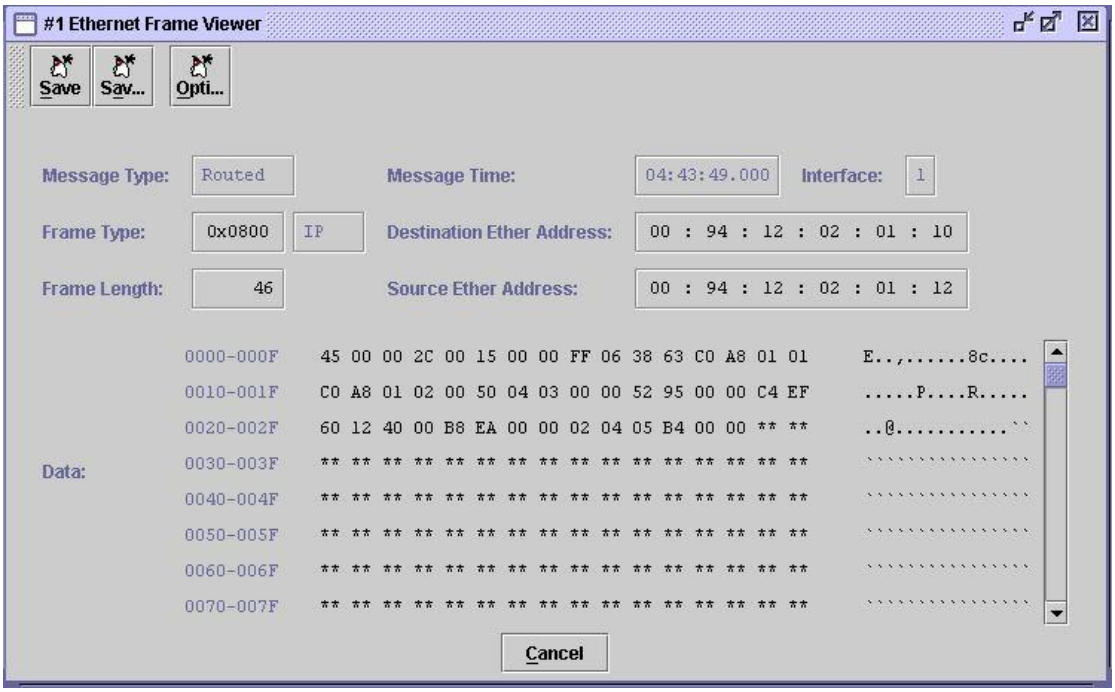
R_2

destination network	subnet mask	next hop

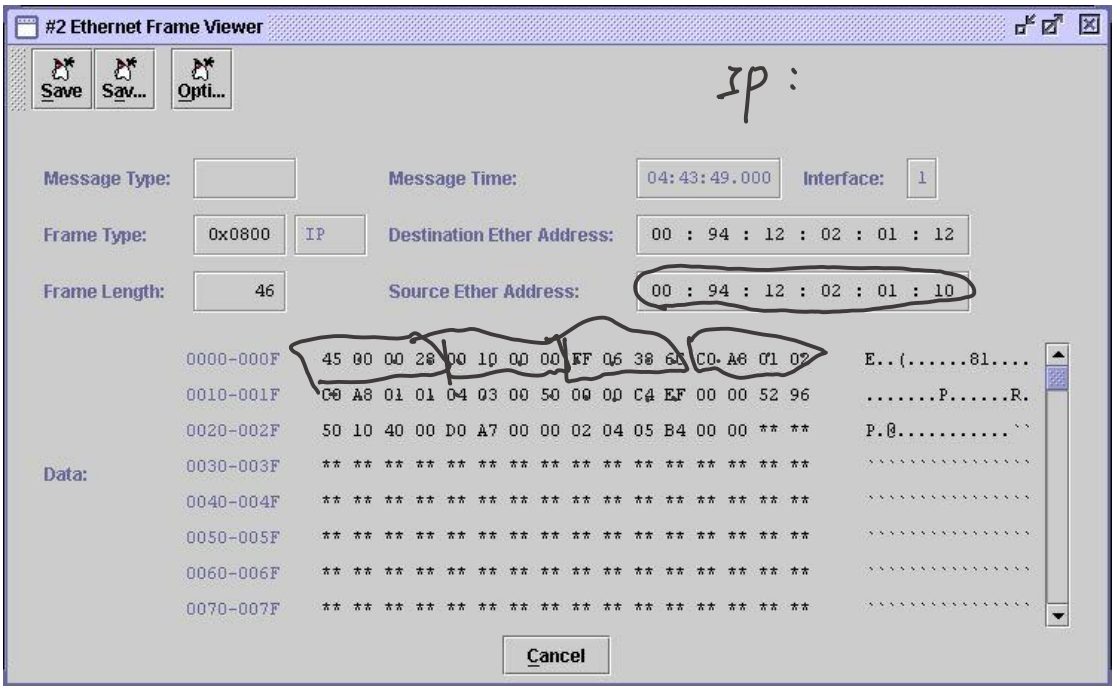
VIII. (20 Marks) Some Ethernet frames are captured from the data link layer of an Ethernet network, which carries IP packets (network layer) and TCP segments (transport layer). Please answer the following questions: 网络层


#0 Ethernet Frame Viewer
Save
Sav...
Opti...
Message Type:
Message Time:
04:43:49.000
Interface:
1
Frame Type:
0x0800
IP
Destination Ether Address:
00 : 94 : 12 : 02 : 01 : 12
Frame Length:
46
Source Ether Address:
00 : 94 : 12 : 02 : 01 : 10
Data:
0000-000F 45 00 00 2C 00 0F 00 00 FF 06 38 69 C0 A8 01 02 E..,.....8i....
0010-001F C0 A8 01 01 04 03 00 50 00 00 C4 EE 00 00 00 00 ....P........
0020-002F 60 02 40 00 0B 91 00 00 02 04 05 B4 00 00 ** ** ..@.....``
0030-003F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
0040-004F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
0050-005F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
0060-006F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
0070-007F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
Cancel

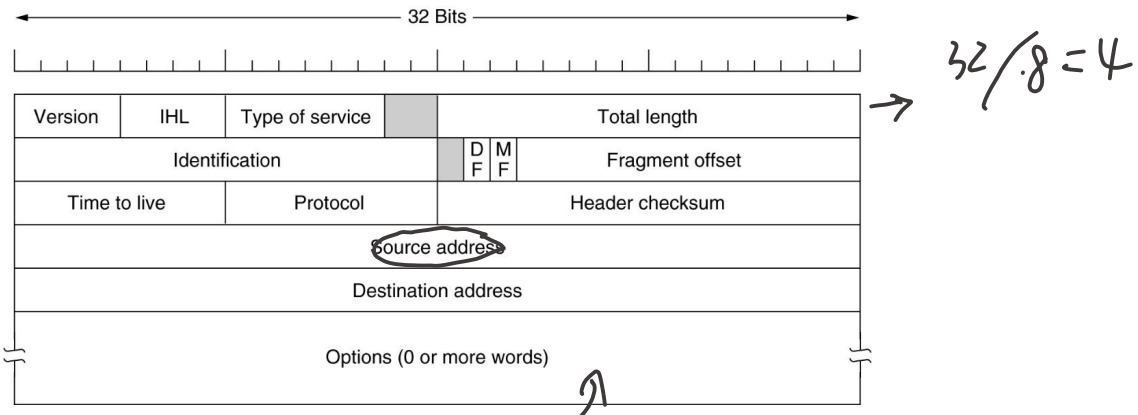
(a)


#1 Ethernet Frame Viewer
Save
Sav...
Opti...
Message Type:
Routed
Message Time:
04:43:49.000
Interface:
1
Frame Type:
0x0800
IP
Destination Ether Address:
00 : 94 : 12 : 02 : 01 : 10
Frame Length:
46
Source Ether Address:
00 : 94 : 12 : 02 : 01 : 12
Data:
0000-000F 45 00 00 2C 00 15 00 00 FF 06 38 63 C0 A8 01 01 E..,.....8c....
0010-001F C0 A8 01 02 00 50 04 03 00 00 52 95 00 00 C4 EF .....P....R.....
0020-002F 60 12 40 00 B8 EA 00 00 02 04 05 B4 00 00 ** ** ..@.....``
0030-003F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
0040-004F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
0050-005F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
0060-006F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
0070-007F ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ````````````````
Cancel

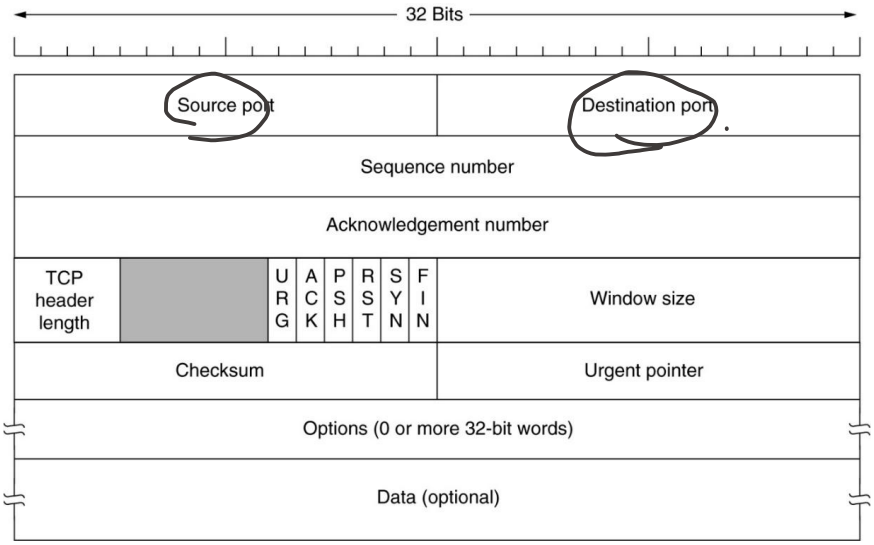
(b)



(c)



(d) The IP header



(e) The TCP header

(1) In Fig (a), what are the IP addresses of the sending host and the receiving host? (in dotted decimal notation)

(2) In Fig (a), what are the port numbers of the sending host and the receiving host? (in decimal)

(3) Please list the sequence number and Acknowledgement number (if valid) of TCP segments in Fig (a), (b) and (c), and observe their change trend;

(4) What functions of the transport layer are realized by three TCP segments in figure (a), figure (b) and figure (c)? Why?