# Beijing Jiaotong University

## 2020—2021 School Year First Semester Exam (A)

**Course Name：Computer Network**

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**Major:__SE__ Class:_____ Name:_____ Student ID:_____**

| No. | 1 | 2 | 3 | 4 | 5 | Total Score |
|---|---|---|---|---|---|---|
| Score | | | | | | |
| Examiner | | | | | | |

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**Part 1. Choose the CORRECT answers from the following choices.（10*2=20 points）**

1. Which of the following famous person are called the "Fathers of the Internet"_____

A. Edsger Wybe Dijkstra
B. Tim Berners-Lee
C. Vint Cerf and Bob Kahn
D. Norman Amramson

2. Which of the following statement about MAC is **false**_____

A. MAC address changes after each boot
B. MAC address is 48 bits in total, which are solidified in the network interface card
C. MAC address is also known as physical address, or the hardware address of the computer
D. MAC address does not change after each boot

3. In the Internet, IP datagrams will go through multiple networks and routers from source to destination. During the entire transfer process, the information contained in the header of the IP datagram_____

A. Neither the source address nor the destination address will change
B. The source address may change but the destination address will not change
C. The source address will not change but the destination address may change
D. Both source and destination addresses may change

4. Which type of protocol does OSPF protocol belongs to _____

A. Interior gateway protocol
B. External routing protocol
C. Hybrid routing protocol
D. Border gateway protocol

5. As the "storage - forward" network graph shown in Figure 1 below, the transmission rate of all links is 100 mbps, the MTU of all links is 1000 bytes. If the host H1 receives a 980000 bytes file from transport layer and will send to host H2, without considering grouping and propagation delay, from H1, at least it needs _____ to finish the transmission

A. 80ms
B. 80.08ms
C. 80.16ms
D. 80.24ms

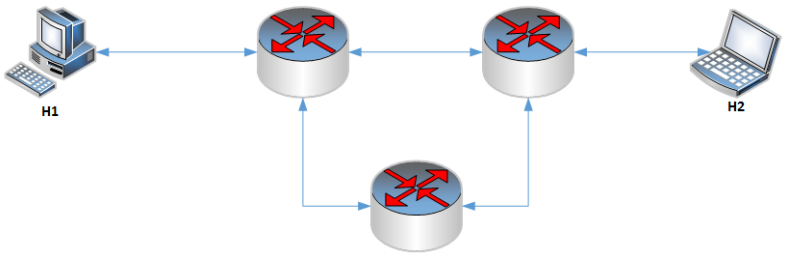


Figure 1

6. How many bits of an IPv6 address have? _____

A. 128 bits
B. 64 bits
C. 48 bits
D. 32 bits

7. A TCP connection has been established between host A and host B. The host A has sent two consecutive TCP segments to host B, containing payloads of 300 and 500 bytes respectively. If the sequence number of the first segment from A starts with 200, after the host B receives the two segments correctly, the confirmation number in the acknowledgement it will send to the host A is _____.

A. 500
B. 700
C. 800
D. 1000

8. If the process of sending and receiving E-mail between user 1 and user 2 is shown in the Figure 2 below, the application layer protocol used in phases ①, ② and ③ in the figure can be _____

A. SMTP, IMAP, POP3
B. IMAP, SMTP, POP3
C. POP3, SMTP, SMTP
D. SMTP, SMTP, POP3

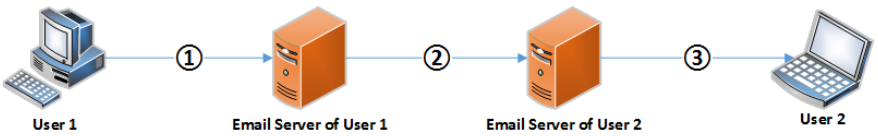


Figure 2

9. Which of the following events occurs during the three way handshakes process of the transport layer? _____

A. Two applications exchange data.
B. TCP initializes the sequence number of the session.
C. UDP determines the maximum unit of bytes needed to send.
D. The server confirms the number of bytes of data will be received from the client.

10. Which of the following addresses exists in 10.48.0.0/12 ? _____

A. 10.63.224.123
B. 10.64.65.216
C. 10.80.119.74
D. 10.96.206.154

**Part 2. Please fill the correct answers in the blanks（5*2=10 points）**

1. If the host part of the IP address is all filled with 1, it represents the _____ address; if the host part of the IP address is all 0, it represents the network address.

2. RIP is a typical distance vector protocol, while OSPF is a _____ protocol.

3. In order to ensure reliable transmission in the data link layer, if the even parity method is used, what is the output for 11111000 after even parity_____.

4. In the transport layer, the UDP protocol is a connectionless protocol that does not provide reliable data transmission service. The TCP protocol is a _____ protocol which provides reliable data transfer.

5. In the OSI model, the _____ layer is responsible for moving packets known as datagrams from one host to another.

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**Part 3. Short Questions (5*3=15 points)**

1. Please explain the difference between an **IP address** and a **MAC address**.

2. Please explain the difference between **TCP** and **UDP**.

3. Please explain the difference between **Slotted Aloha** and **CSMA**.

**Part 4. Network Application Questions (8+8+8+8=32 points)**

1. Host A sent two consecutive TCP segments to host B, with sequence numbers 100 and 170 respectively.
   Please answer the following questions:
   (1) How many bytes of data does the **first segment carry**?
   (2) What should be the **confirmation number** in the acknowledgement sent back by host B after **receiving the first segment**?
   (3) If the **ack confirmation number** returned by host B after receiving **the second segment is 200**, how many bytes of data are carried by the second segment sent by host A?
   (4) If the second segment sent by host A is lost, but the first segment reaches B. B will send acknowledgement to A after the second segment arrives. What is the confirmation number?

2. Assume a router has established the following routing table:

| Destination network | Subnet mask | Next hop |
|---|---|---|
| 100.34.39.0 | 255.255.255.0 | Interface 0 |
| 100.35.39.128 | 255.255.255.128 | Interface 1 |
| 100.35.40.0 | 255.255.255.128 | R2 |
| 50.31.153.0 | 255.255.255.192 | R3 |
| Default | - | R4 |

A total of 4 packets have been received, and their destination IP addresses are:
(1) 100.34.39.10
(2) 100.35.39.126
(3) 100.35.40.126
(4) 50.31.153.48
Please try to calculate the next hop of each packet separately.

3. A company is assigned to an IP address with a CIDR 129.10.0.0/19. The company has 8,000 devices in total. They want to equally spread the devices across **8 different locations**. If you are required to assign IP addresses for these devices. Please calculate **the subnet mask, minimum and maximum IP addresses of each location**.

| Location | Subnet Mask | Minimum IP | Maximum IP |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |

4. Here is a network structure of a network

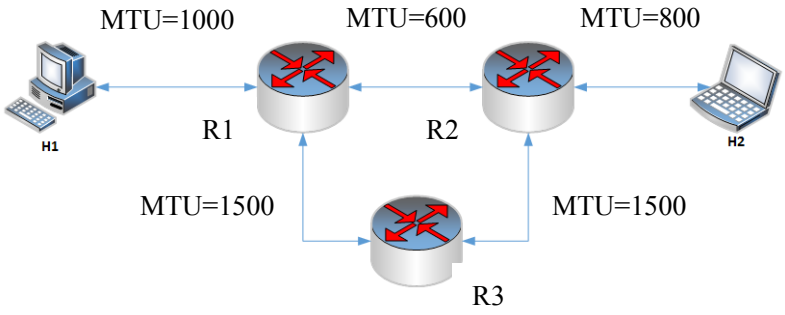



Figure 3

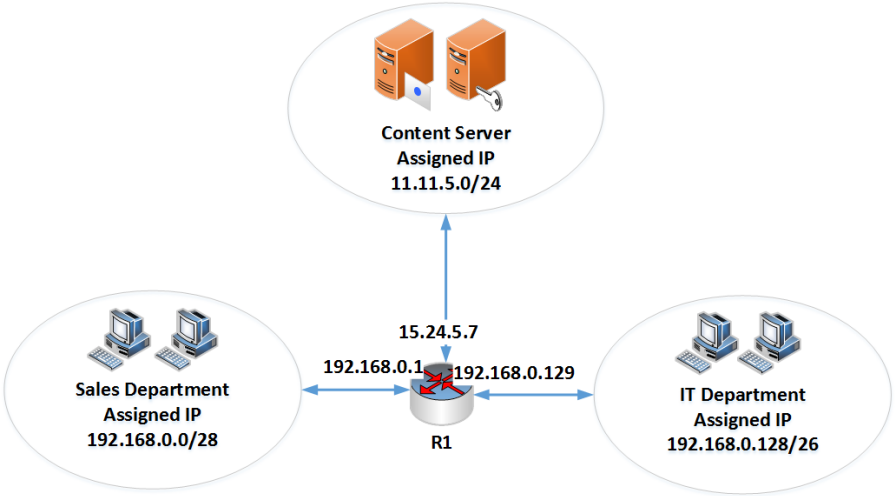
If a 3000 bytes packet (IP header is included) will be sent from H1 to H2, following the route H1-R1-R2-H2.

(1) **how many packets** will be arrived to H2 finally?

(2) And what is the **Total length, DF, MF, Offset value of each packet**?

**Part 5. Network Analysis Questions (10+13=23 points)**

1. Here is a network structure of a company.




(1) What is the IP broadcast address of Sales Department and IT Department?

(2) If each host can be assigned with only 1 IP address, then what is the maximum hosts of IT Department?

(3) If one host 192.168.0.5 from Sales Department wants to send a packet to a Content Server 11.11.5.7 outside the company, and the Server 11.11.5.7 will send back a reply to host 192.168.0.5. Please describe the whole transmission process **(including the source IP address and destination IP address)** and **what kind of technique** will be used in the transmission.

2. There are 4 hosts A, B, C and D in the same physical network.

The IP address of host A is 192.155.28.112;

the IP address of host B is 192.155.28.120;

the IP address of host C is 192.155.28.135;

and the IP address of host D is 192.155.28.202.

Their common subnet mask is 255.255.255.224.

Please answer the following questions:

(1) Which ones of the 4 hosts (A, B, C and D) can communicate directly?

(2) Which ones require a gateway (or router) to communicate?

(3) Please draw a network diagram and indicate the subnet address and host address of each host.

(4) A 5th host E is added. If we want E can communicate directly with D, what is the IP address range of E?