

一、单项选择题（本大题共 20 小题，每小题 1.5 分，共 30 分）。

提示：在每小题列出的四个备选项中只有一个是符合题目要求的，请将其代码填写在下表中。错选、多选或未选均无分。

1. Which of the following protocol layers is not explicitly part of the Internet protocol stack?
A. application layer B. session layer C. data link layer D. Transport layer
2. In the Internet protocol stack, 2-PDU is called:
A. message B. segment C. datagram D. frame
3. Among the following applications, which one is not suitable for P2P architecture:
A. file sharing B. electronic banking
C. video streaming D. instant message
4. Which of the following nodes belongs to the network core?
A. a web server B. a host with Win2008 Server
C. a router without NAT service D. a super node on Skype Network
5. A user requests a Web page that consists of some text and 2 images. The browser's cache is empty. For this page, the client's browser:
A. sends 1 http request message and receives 1 http response messages.
B. sends 1 http request message and receives 2 http response messages.
C. sends 2 http request message and receives 3 http response messages.
D. sends 3 http request message and receives 3 http response messages.
6. Cookies enable
A. a Web server to infect a user's machine with malware
B. a Web server to track a user's activity at its own Web site
C. a Web server to know all previous Web pages visited by the user
D. a Web server to learn a user's personal information.
7. When a user retrieves his email from mail server, which of following protocols can't be used?
A. POP3 B. HTTP C. SMTP D. IMAP
8. In the CSMA/CD protocol, what condition on the transmission delay T_{trans} and the propagation delay T_{prop} has to be satisfied to guarantee that a node always detects a collision?
A. $T_{trans} > T_{prop}$ B. $T_{trans} > 2T_{prop}$
C. $T_{trans} < T_{prop}$ D. $T_{trans} < 2T_{prop}$
9. Two hosts simultaneously send data through a link of capacity 1Mbps. Host A generates data with a rate of 1Mbps and uses TCP. Host B uses UDP and transmits a 100bytes packet every 1ms. Which host will obtain higher throughput?

- A. Host A. B. Host B
C. They obtain roughly the same throughput.
D. They experience congestion collapse and negligible throughput.
10. In network-assisted congestion control, which the statements below is correct?
A. End systems detect congestions only based on observed congestion in the network.
B. End systems use the ATM protocol to detect congestions.
C. Network-layer components provide explicit feedback to the sender regarding the congestion state in the network.
D. None of the above.
11. In TCP, the timeout interval is a function of:
A. estimated RTT at the sender B. MSS and the overhead of a segment
C. the size of buffer at the receiver D. the size of sending window
12. Suppose host A sends host B one TCP segment with sequence number 418, acknowledgement number 571, and 4 bytes of data. Then the sequence number in the acknowledgement to this segment is _____
A. 422 B. 418 C. 571 D. 575
13. Which of the following network device acts on bits? _____
A. HUB B. Switch C. Router D. Bridge
14. Let's assume there is 16-bit piece data 1011 1011 1001 1001, The 8-bit Internet checksum for this data should be _____
A. 01010100 B. 01010101 C. 10101011 D. 10101010
15. For the data in the last question (14), the CRC is applied to it with generator 1001. Thus the CRC bits should be _____
A. 010 B. 001 C. 111 D. 101
16. Consider a router with the switching fabric based on sharing memory. The memory access speed (read and write) is B packets per second. The overall forwarding throughput is always
A. greater than B packets per second B. greater than $B/2$ packets per second
C. less than $B/2$ packets per second D. less than $\sqrt{B}/2$ packets per second
17. In an Ethernet frame, the preamble is responsible for
A. collision detection B. error detection
C. synchronization of the receiver's clock to the sender's clock.
D. multiplexing/ demultiplexing
18. Which of the following services is not provided by DNS? _____
A. host aliasing B. mail server aliasing
C. load distribution D. IP address allocating

19. Given that the requested information is not available at any intermediate databases, a purely recursive DNS query from a requesting host would follow the path:
 - A. Root name server; TLD name server; local name server; authoritative name server.
 - B. authoritative name server; TLD name server; Root name server; local name server
 - C. TLD name server; Root name server; local name server; authoritative name server;
 - D. local name server; Root name server; TLD name server; authoritative name server;
20. During normal IP packet forwarding at a router, which the following packet field will be updated?
 - A. Check sum
 - B. Source IP
 - C. Destination IP
 - D. Type of service

二、判断并说明理由（本大题共 10 小题，每小题 2 分，共 20 分）。

提示：正确打√，错误打×，将其结果填写在下表中，对于错误的，请指出理由。

1. All bit errors can be detected if a packet is sent twice.
2. The efficiency of unslotted ALOHA is twice that of slotted ALOHA
3. Wireless networks can perform collision detection
4. As a link state algorithm, RIP plays an important role in LAN
5. IPv6 routers will be faster than IPv4 routers
6. OSPF is newer and has more flexibility and options than RIP
7. A web cache is both a server and client.
8. The sequence number range must be at least twice the send window for GBN
9. Poisoned reverse can avoid the “count to infinity” problem totally
10. UDP and TCP are the same for applications that send one packet at a time

三、简答题（本大题共 4 小题，共 20 分）。

1. One day at 3:00pm Alice accessed the website www.gonzaga.edu in a campus computer lab. At 3:05pm on the same day in the same computer lab but on a different computer, Bob accessed the website www.seattleu.edu. Bob received his webpage slightly faster than he would have otherwise because of Alice. Describe how this is possible. (5 points)
2. We studied a number of multiple access protocols in this course, including (1) TDMA, (2) CSMA, (3) Slotted Aloha and (4) Token passing. Suppose you were charged with

putting together a LAN to support IP telephony (only) and that multiple users may want to carry on a phone call at the same time. Recall that IP telephony digitizes and packetizes voice at a constant bit rate when a user is making an IP phone call. How well suited are these four protocols for this scenario? Provide a brief (e.g. one sentence) explanation of each answer. (5 points)

3. Assume there is the network as the figure below . The host 10.0.0.1 can communicate with host 138.76.29.23 via a router. The router runs a NAT service and the NAT translation table is described in Fig 1. Let's assume there is a web server running on the host 139.76.29.23. The host 10.0.0.1 sent a http request via port 3345 to this web server. As the packet received by the web server 138.76.29.23, what are the value of source MAC address, source IP address, and source port number, respectively? Provide a brief (e.g. one sentence) explanation of each answer. (5 points)
4. Fill in the value of the congestion window size (number of segments) for each transmission round. Assume the threshold starts at 20 segments and the following events occur: (5 points)
 - triple duplicate ACK during round 4
 - timeout during round 9
 - triple duplicate ACK during round 14

Round	Congestion Window Size	Round	Congestion Window Size
1	1	9	
2		10	
3		11	
4		12	
5		13	
6		14	
7		15	
8		16	

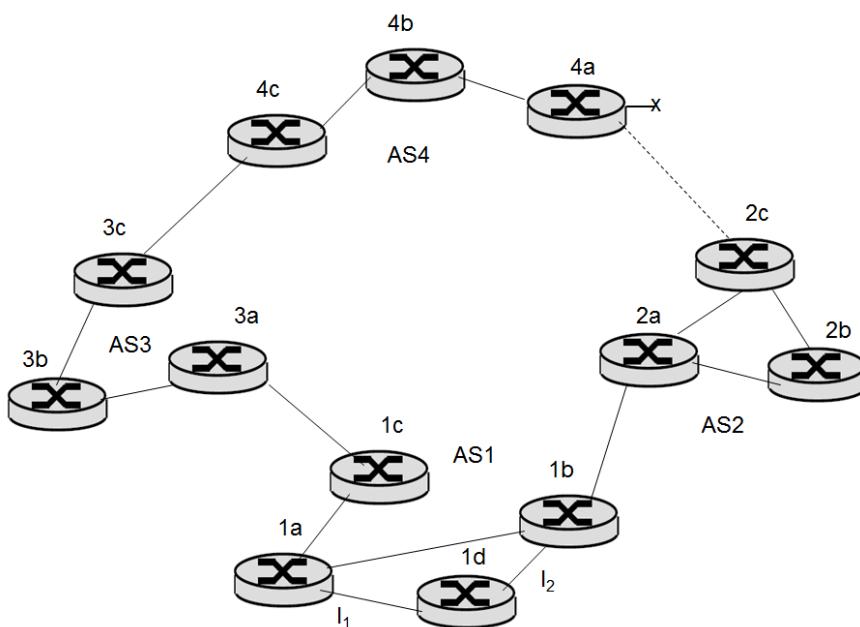
四、计算及分析题（本大题共 2 小题，共 30 分）。

1. (15 points) Consider sending a packet of K bits over a path of m links. Each link transmits at R bps. The network is lightly loaded so that there are no queuing delays. Propagation delay is negligible.
 - A. Suppose the network is a packet-switched virtual circuit network. Denote the VC set-up time by t_s seconds. Suppose the sending layers add a total of h bits of header to each packet. How long does it take to send the file from source to destination? (5 points)

- B. Suppose the network is a packet-switched datagram network and a connectionless service is used. Now suppose each packet has $2h$ bits of header. How long does it take to send the file? (5 points)

C. Finally, suppose that the network is a circuit-switched network. Further suppose that the transmission rate of the circuit between source and destination is R bps. Assuming t_c set-up time and h bits of header appended to the entire file, how long does it take to send the file? (5points)

2. **(15 points)** Consider the network shown below. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is no physical link between AS2 and AS4.



- A. Router 3c, 3a, 1c, and 1d learn about prefix x from which routing protocol, respectively? (4 points)
 - B. Once router 1d learns about x will put an entry (x, l) in its forwarding table. Will l be equal to l1 or l2 for this entry? Explain why in one sentence. (3 points)
 - C. Now suppose that there is a physical link between AS2 and AS4, shown by the dotted line. Suppose router 1d learns that x is accessible via AS2 as well as via AS3. Will l be set to l1 or l2? Explain why in one sentence. (4 points)
 - D. Now suppose there is another AS, called AS5, which lies on the path between AS2 and AS4 (not shown in diagram) . Suppose router 1d learns that x is accessible via AS2 AS5 AS4 as well as via AS3 AS4. Will l be set to l1 or l2? Explain why in one sentence. (4 points)