

### **1. Multiple Choice (30 points, 1.5 points for each question)**

- (13). In \_\_\_\_\_, each station sends a frame whenever it has a frame to send.  
A. ALOHA      B. slotted ALOHA      C. CSMA      D. CSMA/CD
- (14). \_\_\_\_\_ layer handles the physical addressing of communicating devices  
A. Physical      B. Logical      C. Data link      D. Network
- (15). Which best describes the Ethernet protocol?  
A. Talk only if you hear no one else talking, but stop as soon as you hear anybody else.  
B. Pass a ticket around and only talk if you are holding the ticket.  
C. Raise your hand and wait till a moderator gives you permission to talk.  
D. Every person is scheduled a time to talk.
- (16). 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
- (17). Which of the following packet delay is the time waiting at the output link for transmission and depends on the congestion level of router? \_\_\_\_\_  
A. transmission delay      B. propagation delay  
C. queuing Delay      D. processing delay
- (18). The following technologies may be used for residential access, except \_\_\_\_\_  
A. HFC      B. DSL      C. dial-up modem      D. FDDI
- (19). The performance of a network can be measured in terms of \_\_\_\_\_.  
A. delay      B. throughput  
C. packet loss      D. all of the choices are correct
- (20). What is the name of the algorithm used in CSMA/CD networks in order to avoid repeated collisions?  
A. collision avoidance      B. crash prevent  
C. exponential back-off      D. exponential collisions

## 2. True or False ( 20 points, 2 point for each statement ).

- (1). When a user request a Web page that consists of some text and two images. For this page, the client will send one request message and receive three response messages.
- (2). Local DNS name servers cache resource records, but discard them after a period of time that is on the order of a few days.
- (3). A source's retransmission timeout value is always set equal to the measured RTT.
- (4). In TCP, the acknowledgement number that a host puts in a segment is the sequence number of the next byte the host is expecting from the sender.
- (5). Suppose that host A wants to send data over TCP to host B, and host B wants to send data to host A over TCP. Two separate TCP connections - one for each direction - are needed.
- (6). The stop-and-wait protocol is highly inefficient when there is a large distance between source and destination and the transmission rate is high.
- (7). As a link state algorithm, RIP plays an important role in LAN.

- (8). A gateway router can obtain subnet reachability information from another gateway router in neighboring As by iBGP.
- (9). Suppose a router has n input ports each with identical line speeds, n output ports each with identical line speeds, and the line speed of an output port is at least n times as that of an input port. Further suppose that the switching fabric speed is at least n times as fast as an input line speed. Then queuing can occur in an output port
- (10). Switches decrement the TTL field in the IP header

**3. please answer the following questions briefly (30 points, 10 points for each question)**

- (1) The fig 1 shows a portion of the internet with four autonomous systems, one of which is shown with four routers, each with its own /16 subnet. Note that each of the other ASs has a /8 subnet.
- A. Assume that AS1 uses a LS algorithm as its intra-AS routing algorithm and each node initially knows the costs to each of its neighbors. Show how node C compute the shortest path to all the other nodes (*5 points*)

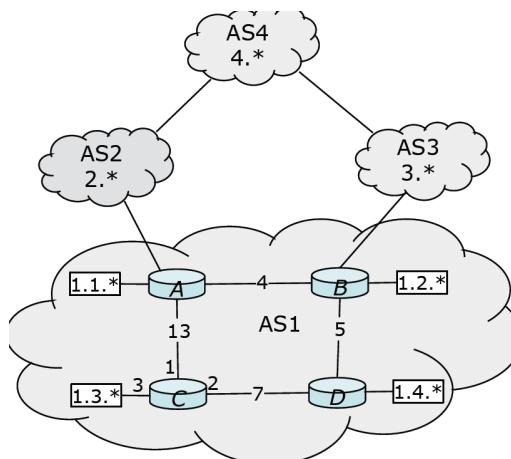


Fig 1

- B. Assume that BGP as the inter-AS routing algorithm among these ASes and there are no policy constraints that must be satisfied. Please complete the forwarding table of node C. (*3 points*)

prefix	Output link
1.1.*	
1.2.*	
1.3.*	
1.4.*	
2.*	
3.*	
4.*	

- C. Suppose the link joining router B with AS3 fails, which entries would change, and how would they change? (*2 points*)
- (2) A host using TCP/IP receives the following 10 fragments in the following order. For ease of reference, the fragments are labeled from A-J. Assume an IP header is 20 bytes and a TCP header is 20 bytes.

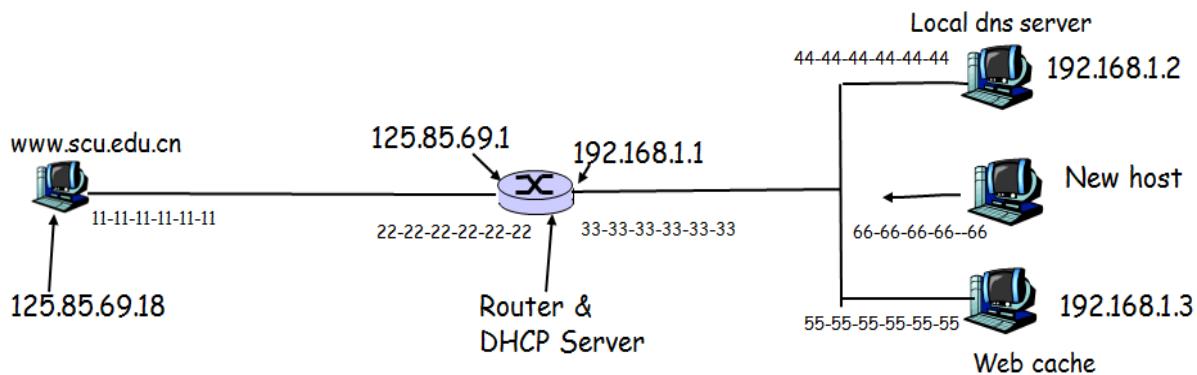
Fragment	Identifier	Length	Offset	Flag
A	1000	500	60	1
B	1000	500	120	1
C	1003	500	0	1
D	1000	500	0	1
E	1001	500	60	1
F	1003	60	60	0
G	1002	500	0	0
H	1001	500	0	1
I	1001	150	120	0
J	1000	200	180	0

- A. In what order are the fragments delivered from the network layer to the transport layer, starting with the first? (3 points)
- B. How many total bytes are sent in these 10 fragments (ignore link layer headers)? (3 points)
- C. How much application layer data (application layer header + message) is sent in these 10 fragments? (4 points)
- (3) Consider a TCP connection using the slow-start congestion control scheme with an initial THRESHOLD value of 64 kB and a Maximum Segment Size (MSS) of 4 kB. The receiver's advertised window is initially 24 kB. The first transmission attempt is numbered 0, and all transmission attempts are successful except for Timeouts on attempt number 4. In the ACKs for transmission attempt number 9 and subsequently, the receiver's advertised window is reset to 20 kB. Find the size in kB of the sender's sending window for its first 11 transmission attempts (numbers 0 – 10)

Transmission Attempts no.	Size of Sending Window (kB)
0	4
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

### 5. Analysis (20 points,)

- (1) As in fig 2. There is new host moves into a network. Thus the new host has to get its IP address from the DHCP server running on the router. Please list the sequence of packets sent or received by the new host until it gets a IP address 192.168.1.4. Please indicate the source and destination MAC address, the source and destination IP address, and the source and destination port number of each packet.(8 points)



, Fig 2.

	Source IP	Dest. IP	Source Port	Dest Port	Source MAC	Dest. MAC	PROTOCOL
1							
2							
3							
4							
5							
6							
7							
8							

- (2) After getting the IP address 192.168.1.4, as in fig 4, the local dns server and the web proxy of the new host is set as 192.168.1.2 and 192.168.1.3, respectively. Now, the user of the new host wants to access an url on the web server [www.scu.edu.cn](http://www.scu.edu.cn). Luckily the dns cache of local dns server has cached the RR of [www.scu.edu.cn](http://www.scu.edu.cn). On the other hand, ARP table of all the nodes in fig 3 are empty. Please list the sequence of all the packets sent/received by the new host as well as any other packets sent/received by as other nodes. Please indicate the source and destination MAC address as well as the source and destination IP address of each packets (12 points)

	Source Port	Dest Port	Source MAC	Dest. MAC
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				