1. Abbreviation Expansion. There are 10 abbreviations of term below. Please expand these abbreviations to the complete terms in either English or Chinese. (15 points, 1 point for each abbreviation

1	2	3	4	5	6	7	8	9	10

(1) . MSS [ ] (2). TDM[ ]

(3). eBGP [ ] (4). IMAP [ ]

(5). ICMP [ ] (6). OSPF [ ]

(7). MTU [ ] (8). EDC [ ]

(9). CSMA/CD [ ] (10).CIDR [ ]

2. Multiple Choice (30 points, 2 points for each question)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

(1). Which of the following networks belongs to datagram network? _____

A. ATM B. X.25 C. WI-FI D. FDM

(2). What is the difference between message switching and packet switching? _____

A. Message switching uses TCP protocol while packet switching is for UDP

B. Message switching involves only logical communications while packet switching involves more

C. Message switching keeps the integrity of the message while packet switching does not.

D. Message switching uses a dedicated connection while packet switching does not

(3). Which one is NOT an advantage of coaxial cable over twist pairs?

A. Longer distance B. Faster transmission speed

C. Cheaper price D. Larger bandwidth

(4). Which of the following nodes belongs to the network core? _____

A. a Web Server B. a Host with Win2003 Server

C. a Router with NAT service D. a Supernode on Skype Network

(5). Which one is a feature of IPv6, different from IPv4? _____

A. more fragmentation B. 128 bit IP address

C. variable length header D. a field of 'More Fragments' (MF)

(6). Which of the following protocols runs on UDP? _____

A. SMTP B. ICMP C.ARP D. RIP

(7). Which of the following protocol doesn't belong to intra-AS routing protocol? _____

A. RIP B. BGP C. OSPF D. IRAP

(8). Which of the following groups belongs to network layer protocol? _____

A. IP, TCP and UDP B. ARP, IP, and UDP

C. FTP, IMAP and IP D. ICMP, BGP, and RIP

(9). The 3-PDU is named as _____

A. message B. packet C. datagram D.segment

(10). An IP datagram of 2000 bytes arrives at a router and must be forwarded to a link with an MTU of 500 bytes. Thus the router has to fragment the datagram. To the last fragment, the value of offset should be _____
A. 1500 B. 1920 C. 188 D.240

(11). Which of the following IP address doesn't belong to the 202.128.0.0/9 network? ____
A. 202.128.128.1B. 202.128.127.11 C.202.127.14.120 D. 202.129.1.129

(12). During normal IP packet forwarding at a router, which the following packet field will be updated? ____
A.Source IP address B. Destination IP address
C. Check sum D. Destination port number

(13). Which of the following MAPs is not a Random Access Protocol? _____
A. CSMA B. ALOHA C. CSMA/CD D. blue-tooth

(14). Let's assume there is 8-bit piece data 10101010, and the CRC is applied to it with generator 1001. Thus the CRC bits should be _____
A. 100 B. 001 C. 111 D. 101

(15). HOL blocking happens on _____
A. input port B. output port C. switching frabrics D. all of above

3. True or False (10 points, 1 point for each statement)。

1	2	3	4	5	6	7	8	9	10

(1). Switches decrement the TTL field in the IP header.

(2). In the 5-layer Internet reference model, network layer handles point-to-point functions while transport layer handles end-to-end functions?

(3). Wireless networks can perform collision detection

(4). Distance Vector Routing Algorithm is newer and has more flexibility and options than Link State Routing Algorithm

(5). A drawback of distance vector routing algorithm is count-to-infinity problem.

(6). A web cache is both a server and client.

(7). The sequence number range must be at least twice the send window for GBN

(8). Congestion control reduces the transmission rate at the sender when the receiver is overloaded

(9). Network node means to end host or router or switch

(10). TCP waits until it has received three duplicate ACKs before performing a fast retransmit.

4. Please answer the following questions briefly (30 points, 5points for each question)。

(1). Host A and Host B are communicating over a TCP connection. Assume the acknowledge number in the segment Host B last send is 300. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 40 and 50 bytes of data, respectively. In the first segment, the acknowledge number is 600, the source port number is 1028, and the destination

port number is 80. Host B sends an ack without any data whenever it receives a segment from Host A. (5 points)

1) In the second segment sent from Host A to B , what are the sequence number , acknowledge number, source port number, and destination pot number? (2 points)
2) If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number? (2 points)
3) If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number? (1 point)

(2). Suppose you open a startup company "starwar" and want to set up your company network. Your network has the following servers:

1. **DNS server: "dns1.starwar.com" with IP as "128.119.12.40"**
2. **Web server: "starwar.com" with two IP as "128.119.12.55" and "128.119.12.56". The web server also has a name as "www.starwar.com".**
3. **Email server: "galaxy.starwar.com" with IP as "128.119.12.60"**

Your company's email address is "username@starwar.com".

1). What resource records (RRs) do you need to provide to the upper-level ".com" Registrar? (2 points)

2). What RRs do you need to put in your company's DNS server? (3 points)

(3). Answer the following questions for the figure (fig 1.) shown below:

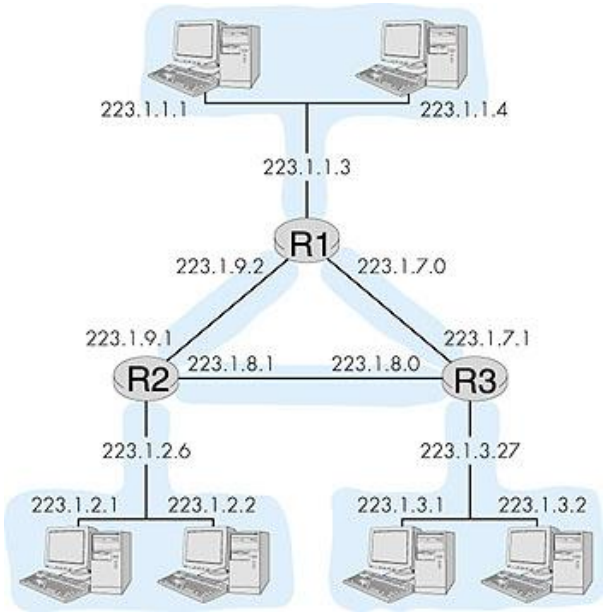

Fig 1.

1) Which host's/router's ARP table entries would change if the host with IP address 223.1.3.2 goes down for a long time? (2 points)
2) Suppose we want to add a new host to the LAN at the top (connected to router R1 via interface 223.1.1.3). What is a valid IP address that can be assigned to this new host? (1 points)
3) Suppose we want to the LAN at the top has enough address to support 60 interfaces. Assign the network address to this LAN. Hint: the assignment should take the form *a.b.c.d/x* (2 points)

(4). Suppose within your web browser you click on a link to obtain a web page. Suppose that the IP address for the associated URL is already cached in your local host. Further suppose that web page contains n very small objects in the same server, the value of RTT between host and web server is r seconds. Neglecting transmission time of these objects, how much time elapses from when the client clicks on the link until the client receives the whole web page with (5 points)

1) nonpersistent HTTP with no parallel TCP connections
2) nonpersistent HTTP with N/K parallel TCP connections (assume N/K is an integer)
3) persistent HTTP without pipelining
4) persistent HTTP with pipelining

(5). Assume there is the network as the figure below (fig 2.). Assume that host 111.111.111.111 sends a message that it wants to be received at host 222.222.222.222.

1) What is the networklayer address that it must use on the message? (1 point)
2) What is the link layer address that it must use on the message? (1 point)
3) What network layer and link layer addresses must it use if the message is to be received by 111.111.111.112? (2 points)
4) How does the node know which link layer address to use? (1 point)

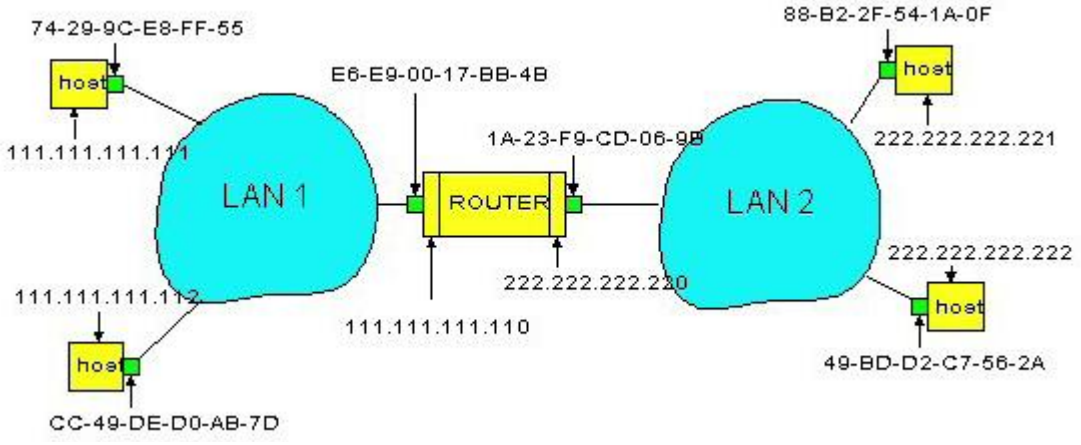

Fig 2.

(6). Consider the network shown below (Fig 2.) and assume that each node initially knows the costs to each of its neighbors. Consider the link state algorithm and show how node E compute the shortest path to all the other nodes.(5 points)

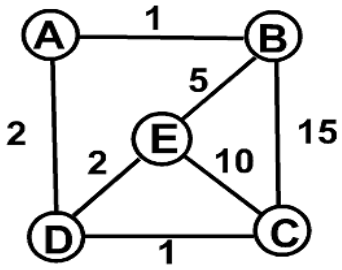

Fig 3

5. Application (20 points, 10 points for each question)

(1). In the topology below (Fig 4), assume that all links are 10Mbps. The web server for this organization is quite busy, and serves on average 100 web page requests per second, where each page consists 10 objects in total that are 1KB in size each.(10 points, 2points for each question)

1) How much bandwidth is remaining for communication between nodes A and E in the network? (Be careful to convert between bytes and bits, above)

2) Which of these hubs would you convert to a switch to increase the available bandwidth between A and E?

3) If you needed to support 8Mbps of traffic between the three pairs of nodes (A, E), (D,G), and (B,H), what would the total capacity of the switch need to be (including traffic to/from the web server)?

4) If you connected each of the three remaining hubs to each other, would that reduce traffic at the switch?

5) If you connected the web server directly to the router, would that reduce traffic at the switch?

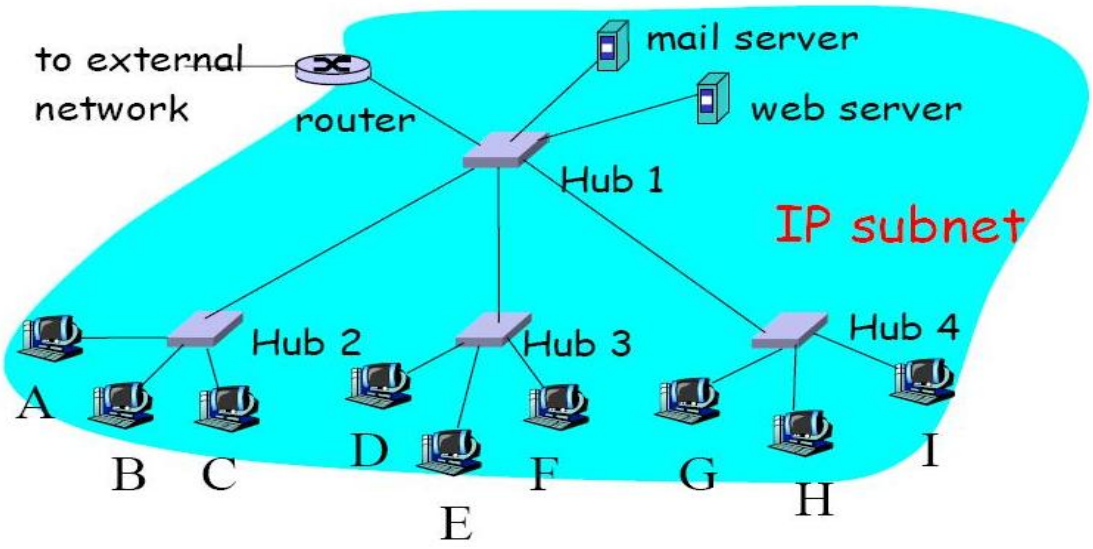

Fig 4.

(2). Assuming TCP Reno is the protocol experiencing the behavior shown below (Fig 5.) answers the following questions.

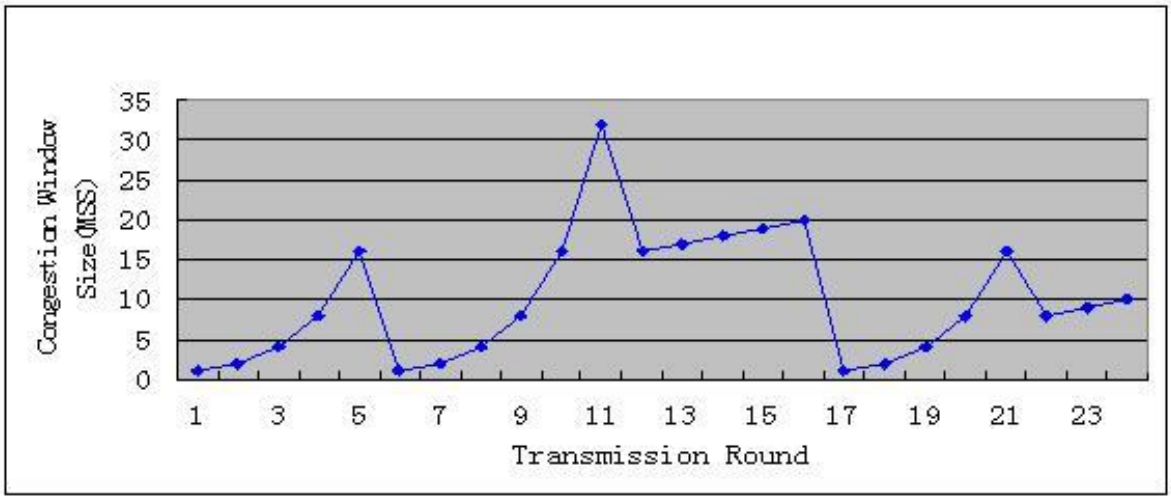

Fig 5.

1). Identify the intervals of time when TCP slow start is operating.
2). Identify the intervals of time when TCP congestion avoidance is operating.
3). After the 5th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout
4). After the 11th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout
5). What is the value of threshold at the 12th transmission round
6). What is the value of threshold at the 17th transmission round
7). During what transmission round is the 70th segment sent?
8). Assuming a pkt loss is detected after the 24th round by the receipt of a triple duplicate ACK, what will be the values of the congestion window size and of threshold?