华东师范大学期末试卷（ A 卷）
2017—2018 学年第一学期

课程名称：计算机网络

学生姓名：_____ 学号：_____

专业：_____ 年级/班级_____

课程性质：专业必修

一	二	三	四	五	六	七	八	总分	阅卷人签名

PART 1. Briefly explain the following jargons.（3 points each，15 points in all）

1. Piggybacking
2. ARQ (Automatic Repeat reQuest)
3. Three-way Handshaking for TCP
4. VLAN
5. CSMA/CA

PART 2. Briefly answer the following questions（5 points each，30 points in all）

1. Consider an application that transmits data at a steady rate (for example, the sender generates an N-bit unit of data every k time units, where k is small and fixed). Also, when such an application starts, it will continue running for a relatively long period of time. Answer the following questions, briefly justifying your answer:

(1) Would a packet-switched network or a circuit-switched network be more appropriate for this application? Why? (2 points)

(2) Suppose that a packet-switched network is used and the only traffic in this network comes from such applications as described above. Furthermore, assume that the sum of the application data rates is less than the capacities of each and every link. Is some form of congestion control needed? Why? (3 points)

2. What is the relationship between protocol and service? Describe their differences.

3. Consider the count-to-infinity problem in the distance vector routing. Will the count-to-infinity problem occur if we decrease the cost of a link? Why? How about if we connect two nodes which do not have a link?

4. Suppose you purchase a wireless router and connect it to your cable modem. Also suppose that your ISP dynamically assigns your connected device (that is, your wireless router) one IP address. Also suppose that you have five PCs at home that use 802.11 to wirelessly connect to your wireless router.
(1) How are IP addresses assigned to the five PCs? (2 points)
(2) Does the wireless router use NAT? Why or why not? (3 points)

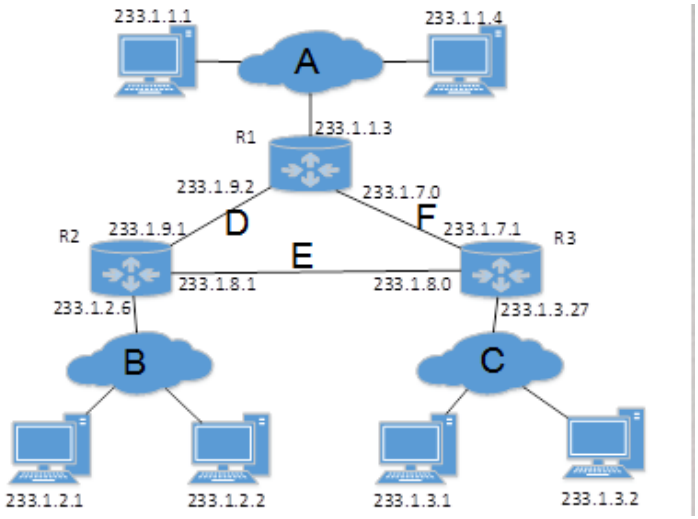
5. If all the links in the Internet were to provide reliable delivery service, would the TCP reliable delivery service be redundant? Why or why not?

6. If a binary signal is sent over a 4-kHz channel whose signal-to-noise ratio is 20 dB, what is the maximum achievable data rate?

PART 3. Computations and applications（55 points in all）

1. Consider sending a large file from a host to another over a TCP connection that has no loss.
(1) Suppose TCP use AIMD（Additive Increase Multiplicative Decrease） for its congestion control without slow start. Assuming the congestion window CongWin increases by 1 MSS every time a batch of ACKs is received and assuming approximately constant round-trip times, how long does it take for CongWin to increase from 1 MSS to 10 MSS (assuming no loss events)? (4 points)
(2) What is the average throughput (in terms of MSS per RTT) for this connection up through time = 9 RTT? (4 points)

2. Consider a network topology shown in the figure below. Denote the three subnets with hosts as Networks A, B, and C. Denote the subnets without hosts as Networks D, E, and F.
(1) Re-assign network addresses to each of these six subnets, with the following constraints: All addresses must be allocated from 214.97.254.0/23; Subnet A should have enough addresses to support 250 interfaces; Subnet B should have enough addresses to support 120 interfaces; and Subnet C should have enough addresses to support 120 interfaces. Of course, subnets D, E and F should each be able to support two interfaces. For each subnet, the assignment should take the form `a.b.c.d/x` or `a.b.c.d/x – e.f.g.h/y`. (6 points)
(2) Using your above answer, provide the forwarding tables (using the longest prefix matching) for each of the three routers. (6 points)



3. Frames of 1000 bits are sent over a 1-Mbps channel using a geostationary satellite whose propagation time from the earth is 270 msec. Acknowledgements are always piggybacked onto data frames. The headers are very short. Three-bit sequence numbers are used. What is the maximum achievable channel utilization for

(1) Stop-and-wait? (3 points)

(2) Go-back-N ? (3 points)

(3) Selective repeat ? (3 points)

4. Suppose that host A is connected to a router R1, R1 is connected to another router R2, and R2 is connected to host B. Suppose that a TCP message that contains 900 bytes of data and 20 bytes of TCP header is passed to the IP code at host A for delivery to B. Show the Total length, Identification, DF, MF, and Fragment offset fields ofthe IP header in each packet transmitted over the three links. Assume that link A-R1 can support a maximum frame size of 1024 bytes including a 14-byte frame header, link R1-R2 can support a maximum frame size of 512 bytes, including an 8-byte frame header, and link R2-B can support a maximum frame size of 512 bytes including a 12-byte frame header. (10 points)

5. A CDMA receiver gets the following chips: (-1 +3 -1 -1 -1 +1 -1 -3). Assuming there are four stations with the following chip sequences {A:(-1-1-1+1+1-1+1+1), B:(-1-1+1-1+1+1+1-1), C:(-1+1-1+1+1+1-1-1), D:(-1+1-1-1-1-1+1-1) }, which stations transmitted, and which bits did each one send? (6 points)

6. A 10-bit stream 1001001101 is transmitted using the standard CRC method. The generator polynomial is x^3 +x+ 1. Show the actual bit string transmitted. Can the receiver detect any 2-bits errors? Give an example of bit errors in the bit string transmitted that will not be detected by the receiver. (10 points)