Q1: In the data link layer, if a frame is sent with the following info, please use the byte count, byte stuffing and bit stuffing methods to construct the final frame.

FLAG: 01111110 ESC: 11100000 Data bits: 11111000 10001111 01111110

1. Byte Count

00000110 01111110 11100000 11111000 10001111 01111110

1. Byte Stuffing

01111110 11111000 10001111 01111110 11100000 01111110

1. Bit Stuffing

111110000 10001111 011111010

Q2: In the data link layer, if the frame data is sent with the following info, please use parity, checksum, CRC and Hamming methods to construct the final frame.

Data bits: 11111000 10001111 01111110 11100000

1. Parity

111110000 100011110 011111101 111000000 odd

111110001 100011111 011111100 111000001 even

1. Checksum

11111000-F8 10001111-8F 01111110-7E 11100000-E0

F88F+7EE0= 1776F —— 776F+1= 7770 反置 888F

1. CRC, with the generator polynomial G(*x*)=*x*5+*x*3+*x*+1

Generator 101011

11111000 10001111 01111110 11100000 10011

1. Hamming

xx1x 111x 1000 100x 0111 1011 1111 011x 1000 00

0010 1111 1000 1000 0111 1011 1111 0111 1000 00

Q3: In the data link layer, we are using CSMA/CD network to send the frame.

Equation:

1. If the cable length is 10km, the data rate is 1Gb/s, the signal rate in the cable is 2\*105km/s, what is the minimum frame size?

Minimum frame size = = = 2\*10-4 Gb

1. If the minimum frame length increases 64 bytes, what will happen to the length of cable?

Cable length = = =20.00596046km

The length of cable will increase about 10km

Network layer

1. Assume that 6 routers exist in the network (A, B, C, D, E, F), the routers are using DV algorithm.

At one moment, the router C receives the vector (5,0,8,12,6,2) from B, the vector (16,12,6,0,9,10) from D, the vector (7,6,3,9,0,4) from E. C knows the shortest path to B, D, E are 6, 3 and 5.

What is the shortest path table of C to all routers (A, B, C, D, E, F)?

(11,6,0,3,5,8)

1. Here is a Routing Table of Router A

|  |  |
| --- | --- |
| Target Network | Next Hop |
| 112.0.0.0/8 | R1 |
| 112.0.0.0/11 | R2 |
| 112.19.232.0/22 | R3 |
| Default | R4 |

Please answer the packets from following IP addresses will be forwarded to which Router?

1. 112.0.232.3
2. 112.18.5.7
3. 112.19.237.5
4. 112.25.16.4
5. 112.115.74.5

R1 112.0.0.0 – 112.255.255.255

R2 112.0.0.0 – 112.31.255.255

R3 112.19.232.0 – 112.19.235.255

So a) R2 b) R2 c) R3 d) R2 e) R1

1. If a network has been assigned to 128.90.10.0/27, the subnet mask is 255.255.255.224, what is the maximum subnets it supports? And what is the IP address range of each subnet?

子网数：8

子网1：128.90.10.0~128.90.10.31

子网2：128.90.10.32~128.90.10.63

子网3：128.90.10.64~128.90.10.95

子网4：128.90.10.96~128.90.10.127

子网5：128.90.10.128~128.90.10.159

子网6：128.90.10.160~128.90.10.191

子网7：128.90.10.192~128.90.10.223

子网8：128.90.10.224~128.90.10.255

1. Here is a NAT table of Router A

|  |  |  |
| --- | --- | --- |
| Assigned Port | Target IP address | Source Port |
| 2056 | 192.168.32.56 | 21 |
| 2057 | 192.168.32.56 | 20 |
| 1892 | 192.168.48.26 | 80 |
| 2256 | 192.168.55.106 | 80 |

If it receives a packet from 192.168.32.56, port 80, what will the Router A do for this packet?

它将拒收这个包

1. Here is a network structure of a network

Router A

Router B

Router C

MTU 1500

MTU 800

If a 3000 bytes packet (IP header not included) will be sent from Router A to Router C, how many packets will be arrived to Router C finally? And what is the Total length, DF, MF, Offset value of each packets?

B

1 20 1480 1 1 0(DF,MF,Offset)

2 20 1480 1 1 1480

3 20 40 1 0 2960

C

1 20 780 1 1 0

2 20 700 1 1 780

3 20 780 1 1 1560

4 20 700 1 1 2260

5 20 40 1 1 2960

5 packets will be arrived to Router C finally

**Transport Layer**

1. In a TCP connection, the MSS is 1KB, one timeout event appears when the congestion window = 34KB, the following transactions in 4 RTTs are successful, what is the congestion window size now?
2. If the TCP congestion window threshold is set to 8, one timeout event appears when congestion window rise up to 12, TCP launches slow start and congestion avoidance, what is the congestion window size of the 13th transactions?
3. Host A wants to establish a TCP connection to host B, with a segment (SYN =1, seq =11220), if the host B accepts the connection establishment request, what will be the following transactions from host A and host B?
4. Host A and host B has set up a TCP connection, the host A has sent two TCP segments to host B, containing 300 bytes and 500 bytes data, the sequence number of the first segment is 200, when host B successfully receives the two segments, what is the ACK sequence number it will sent back to host A?
5. Host A and host B has set up a TCP connection, the host A has sent three TCP segments to host B, containing 300 bytes, 400 bytes and 500 bytes data, the sequence number of the third segment is 900, if the host B only receives the first and the third segments, what is the ACK sequence number it will sent back to host A?

**Application Layer**

1. If a host has to analyze the IP address of [www.baidu.com](http://www.baidu.com),

its local DNS server has been set to 202.120.66.68,

the root DNS server IP is 11.2.8.6,

the .com DNS server IP is 28.5.2.9,

the baidu company DNS server IP which runs [www.baidu.com](http://www.baidu.com) service is 202.113.16.10,

if the iterative query process is performed to the local DNS server, please explain the host DNS query process for [www.baidu.com](http://www.baidu.com)

1. When you enter <http://www.bjtu.edu.cn> in your browser, until the bjtu webpage has been fully illustrated in the browser, how many protocols involved in the process and please explain when they are used?
2. What is the difference between POP3 and IMAP?