软 件 学 院 **2023** 级 软 件 工 程 专 业 (2023-2)

《 计算机网络》 期 末 试 题 试 卷**(B)**

(考 试 形 式 ： 闭 卷　 考 试 时 间 **：** **2** 小 时**)**

《中山大学授予学士学位工作细则》 第六条

考 试 作 弊 不 授 予 学 士 学 位

方向:　　姓名:　　学号:　　成绩:

注意：答案一定要写在答卷中，写在本试题卷中不给分。本试卷要和答卷一起交回。

答卷指南:

1） 考题共 8 题，另有一道加分题。

2） 可选中文或者英文来答卷。

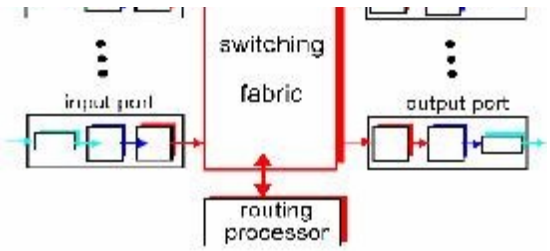
1） (10points) Compute the CRC for a given message (M) and a generator polynomial (P). M is 0111101 and P is 1011.

2） (10points) CSMA/CD

a) Explain CSMA/CD protocol, and how it backs off when conflicts happen.

b) Compute the minimum possible frame size for a CSMA/CD protocol given the following parameters. Maximum medium span is 5000 meters (signal propagation is 5 nanoseconds per meter) and the data rate is 100-Mbps.

3） (10points) Where (input ports and/or output ports) can queueing occur in a router? Briefly explain the conditions that lead to such queueing.



4） (15points) Explain the distance vector routing algorithm and give answers to the following questions.

A router has the following (CIDR) entries in its routing table:

Address/mask　　Next hop

Address/mask	Next hop
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
default	Router 2

For each of the following IP addresses, what does the router do if a packet with that address arrives?

(a) 135.46.63. 10

(b) 135.46.57. 14

(c) 135.46.52.2

(d) 192.53.40.7

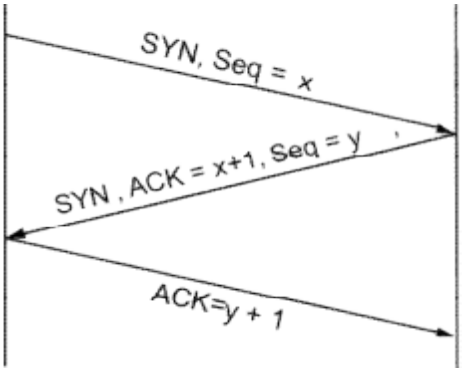
(e) 192.53.56.7

5） (15points) Consider a 4-layer protocol implementation with application, TCP, IP, and Ethernet layers in that order (top to bottom). Each layer requires a header except the Ethernet layer, which requires a header and trailer. The application header is 16 bytes in length, TCP header 20 bytes, IP header 20 bytes, and let the Ethernet header be 14 bytes, and the trailer 4 bytes (ignore the preamble and gap). Answer the following questions:

a) Sketch a packet for this system carefully showing and labeling all fields.
b) Assume a maximum data field for an Ethernet frame of 1600 bytes. What is the overhead (in %) for a 4096-byte application message? Hint: the message must be segmented into multiple frames and be careful of how you consider the data field in the Ethernet frame.

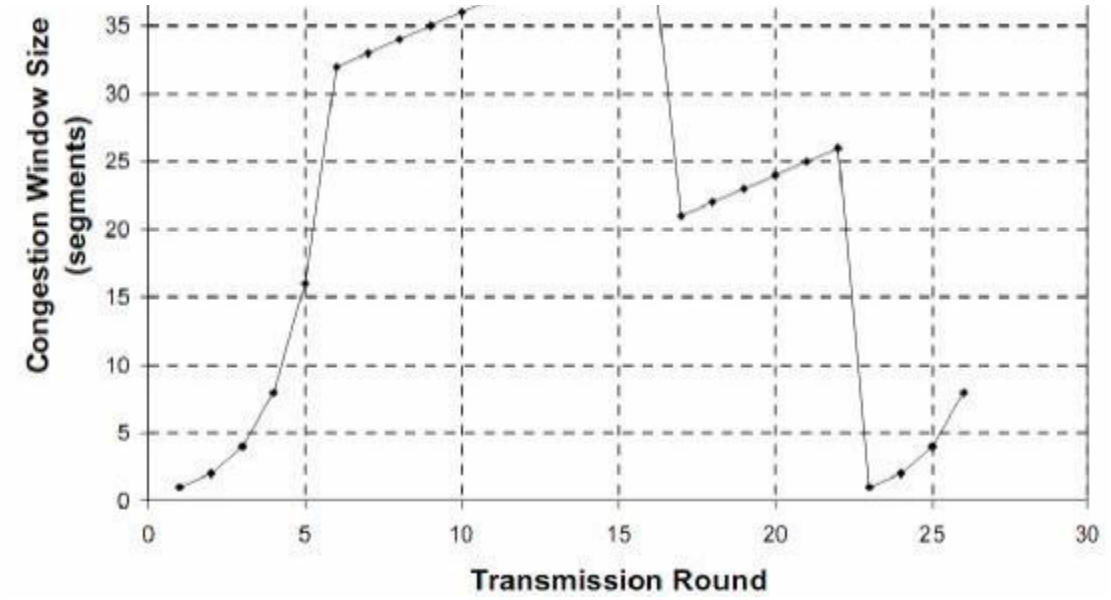
6） (10points) Consider in the Transport Layer, clients and servers us SYN, ACK, FIN etc to initiate and terminate connections.

When initiating a connection, the following sequence of SYN/ACK takes place.



Please describe how a web browser terminates its connection with a web server by following the example above.

7） (15points) Consider the following plot of TCP window size as a function of time:



Assuming TCP Reno is the protocol experiencing the behavior shown above, answer the following questions.

(a) Identify the intervals of time when TCP slow start is operating.

(b) Identify the intervals of time when TCP congestion avoidance is operating(AIMD)

(c) After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?

8） (15points) CSMA/CA

a) What is CSMA/CA?
b) Why WIFI uses CSMA/CA?
c) How CSMA/CA works?

Bonus Question: (10points) Suppose a system picks a symmetric key authentication protocol using an authentication server. Below $\{m\}_k$ denotes the encryption of message m by key k. We assume A is a trusted authentication server which shares a secret key kXA with each principal X in the system.

(1) P ” Q	: “I am P.”
(2) Q ” P	: generate nonce n
(3) Q ” P	: n
(4) P ” Q	: $\{n\}_{kPA}$
(5) Q ”A	: $\{P, \{n\}_{kPA}\}_{kQA}$
(6) A ” Q	: $\{n\}_{kQA}$

Someone has identified a serious flaw in the protocol. Can you identify the step(s) which may cause security problems? Can you propose a fix?