Dept. of Computer Science and Engineering, National Sun Yat-sen Univ. First Semester of 2022 PhD Qualifying Exam

Subject： Computer Networks

1. What is Frequency Division Multiplexing (FDM)? What is Time Division Multiplexing (TDM)? What is packet switching?
2. For Internet Protocol Stack, there are five layers? Please draw the Internet Protocol Stack and explain the function of each layer, respectively.
3. Encapsulation is a method adopted repeatedly in computer networking. What are the advantages of the encapsulation method? Please draw pictures to explain the operations of encapsulation. Please describe four examples in which the encapsulation method is used.
4. Please draw a graph to show the operations of Transmission Control Protocol (TCP) congestion control. The slow start phase, congestion avoidance phase, and experiencing a time out or three repeated ACKs must be included in your picture and explanations. How can we achieve a reliable data transfer under unreliable channel conditions?
5. What is a Domain Name System (DNS)? There are four types of Resource Records (RRs). Please explain each type in some detail.
6. There are four main causes of a packet delay. Please draw a picture to explain them in order. Please also explicitly demonstrate the differences between the transmission delay and the propagation delay. When the traffic load is larger than a threshold (0.9 as an example), the queuing delay increases exponentially. Why is it?
7. Please write a pseudo-code of TCP socket programming for simple client-server interactions. Please also give remarks to your codes for easy reading.
8. What is demultiplexing in TCP and User Datagram Protocol (UDP), respectively? Please draw pictures to show the differences in demultiplexing in TCP and UDP.
9. Please write the pseudo-code for Dijkstra's algorithm and provide some remarks for your code.
10. What is Carrier Sense Multiple Access with Collision Detection (CSMA/CD)? Why is CSMA/CD used in IEEE 802.3 wired Ethernet? What is Multi-Protocol Label Switching (MPLS)? What is Software-Defined Networking (SDN)? Please explain them in your words.