

CSX3005 (Computer Networks) Pre-midterm Assignment 1/2023

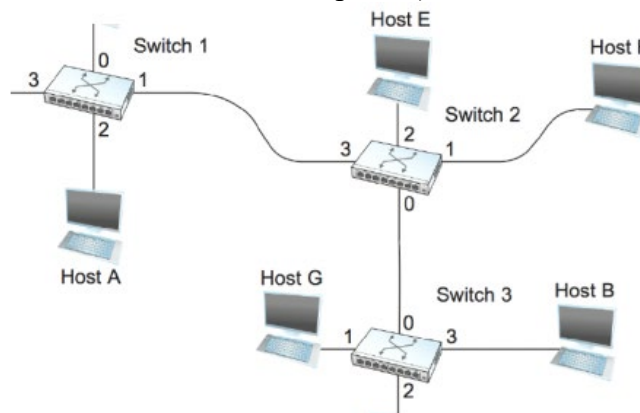
Total 68 Points

1. [20 Points] Check whether the following statements are true (T) or false (F):

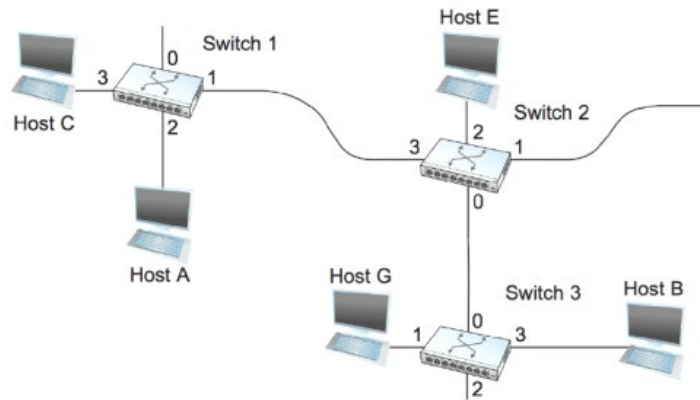
- 1.1. Wireless links, such as those provided by cellular and Wi-Fi networks, are multiple access links.
- 1.2. Routing determines how to forward messages toward the destination node based on its address.
- 1.3. Peer-to-peer (P2P) computing or networking is a distributed application architecture that partitions tasks or workloads between peers.
- 1.4. The presentation layer concerns the router format exchanged between peers.
- 1.5. the application interacts with the transport layer protocols for calculating IP addresses in the layered Internet architecture.
- 1.6. In Internet architecture, the transport layer divides the data stream into small units called packets.
- 1.7. A network link is a physical medium carrying signals in the form of electromagnetic waves.
- 1.8. The Manchester encoding scheme never doubles the rate of signal transitions.
- 1.9. The extra bits transmitted with the message are called error-detecting codes.
- 1.10. A major goal in designing error detection algorithms is to maximize the probability of detecting errors using many redundant bits.
- 1.11. The Internet is a globally connected network system that uses TCP/IP to transmit data via various media types.
- 1.12. Internet technology reveals the details of network hardware and permits computers to communicate independently of their physical network connections.
- 1.13. Routers use the destination network, not the destination computer, when forwarding a packet.
- 1.14. Protocols allow one to specify or understand network communication with the knowledge of particular network hardware.
- 1.15. An IP address uniquely identifies the source and destination of data transmitted with the Internet Protocol.
- 1.16. In subnetting, the subnet mask covers the Internet and the physical network portions of the address to distinguish the network and host IP addresses.
- 1.17. 196.168.1.0 is a class B network address.
- 1.18. In a classless address scheme, subnet addressing is permitted to use the network prefix of the address to be an arbitrary length and is not fixed.
- 1.19. In subnetting, the subnet mask covers the Internet and the physical network portions of the address to distinguish the network and host IP addresses.
- 1.20. TCP/IP uses the term host to refer to an end system that attaches to the internet.

2. [3 Points] What three main stakeholders are required to develop a computer network? Briefly describe the functions of each stakeholder.

3. [2 Points] Consider a digital library program being asked to fetch a 20MB (megabyte) size. Suppose the channel has a bandwidth of 10 Mbps (millions of bits per second). Calculate the throughput of the channel (show your calculation steps).
4. [3 Points] Briefly describe the non-return to zero (NRZ) encoding issues.
5. [3 Points] Show the non-return to zero inverted (NRZI) encoding result of the following 16-bit data: **1010110011011101**
6. [4 Points] Show the 4B/5B encoding on the following 16-bit data with the help of the 4B to 5B conversion shown in Figure1: **0110011101001010**
7. [2 Points] Find the checksum of the following two 8-bit data: **1010 1010** and **11010110**
8. [4 Points] Assume that the original transmission message (in polynomial) $M(x) = x^7 + x^5 + x^4 + x^3$ and the channel divisor polynomial $C(x) = x^3 + x + 1$. Calculate the **Cyclic Redundancy Check (CRC) polynomial of the network** (or show its binary equivalent).
9. [2 Points] Briefly describe how a **network switch** decides which output link to place each packet.
10. [5 Points] Consider a network with the address **211.165.13.0**. Subnetting the network with the **starting 4-bit value of the last octet** of its address. Show all of its valid subnet addresses (in dotted decimal form). What is its subnet mask?
11. [4 Points] Show all the **/25** subnets in the **132.42.6.0/23** address block.
12. [5 Points] Consider a datagram network illustrated in the Figure below. In which the hosts have addresses A, B, C, and so on. Assume that **Host A** wants to send a packet to **Host G**. Construct the **forwarding (routing) tables** for the switches that support the packet transmission from **A** to **G** (assume that during a routing process, when a data packet turns up, the forwarding table will have the right information to forward/switch the packet).



13. [5 Points] Consider a virtual circuit network illustrated in Figure below, in which the hosts have addresses A, B, C, and so on. Assume that **Host A** wants to send packets to **Host G**. Show the **virtual circuit (VC) table entry** for switches that are involved in packet routing from **A** to **G** (assume your **virtual circuit identifier (VCI)** for each switch).



14. [6 Points] Consider a simple internetwork illustrated in **Figure (a)**, where **H** denotes a **host**, and **R** denotes a **router**. Assume that a **1556-byte datagram** (**20-byte IP header** plus **1536-byte data**) is sent from **host H4** to **host H8**. The MTU of **network1**, **network2**, and **network3** is **1556-byte**. But the MTU of **network 3** is **532 bytes** (20-byte IP header plus 512-byte data). The IP datagram traversing a sequence of unfragmented and fragmented datagrams through the physical networks is shown in **Figure 4 (b)**. Show the **data**, **flag**, and **offset** values of fragmented and unfragmented IP datagrams in **a**, **b**, **c**, **d**, and **e**.

