1. What is network neutrality? Why has the Internet operated under net neutrality up to this point in time?

• Network neutrality is the idea that Internet service providers must allow customers equal access to content and applications regardless of the source or nature of the content. Presently the Internet is indeed neutral: All Internet traffic is treated equally on a first-come, first-serve basis by Internet backbone owners.

• The Internet is neutral because it was built on phone lines, which are subject to ‘common carriage’ laws. These laws require phone companies to treat all calls and customers equally. They cannot offer extra benefits to customers willing to pay higher premiums for faster or clearer calls, a model known as tiered service.
2. Who's in favor of network neutrality? Who's opposed? Why?

- Those in favor of network neutrality include organizations like MoveOn.org, the Christian Coalition, the American Library Association, every major consumer group, many bloggers and small businesses, and some large Internet companies like Google and Amazon. Verizon and Google proposed a split proposition – enforce net neutrality on wired connections, but not on wireless networks. Some members of the U.S. Congress also support network neutrality. This group argues that the risk of censorship increases when network operators can selectively block or slow access to certain content. Others are concerned about the effect of slower transmission rates on their business models if users can’t download or access content in a speedy fashion.

- Those who oppose network neutrality include telecommunications and cable companies who want to be able to charge differentiated prices based on the amount of bandwidth consumed by content being delivered over the Internet. Some companies report that 5 percent of their customers use about half the capacity on local lines without paying any more than low-usage customers. They state that metered pricing is “the fairest way” to finance necessary investments in its network infrastructure. Internet service providers point to the upsurge in piracy of copyrighted materials over the Internet as a reason to oppose network neutrality. Comcast reported that illegal file sharing of copyrighted material was consuming 50 percent of its network capacity. The company posits that if network transmission rates were slower for this type of content, users would be less likely to download or access it. Those who oppose network neutrality argue that it removes the incentive for network providers to innovate, provide new capabilities, and upgrade to new technology.

3. What would be the impact on individual users, businesses, and government if Internet providers switched to a tiered service model?

- Proponents of net neutrality argue that a neutral Internet encourages everyone to innovate without permission from the phone and cable companies or other authorities. A more level playing field spawns countless new businesses. Allowing unrestricted information flow becomes essential to free markets and democracy as commerce and society increasingly move online. Heavy users of network bandwidth would pay higher prices without necessarily experiencing better service. Even those who use less bandwidth could run into the same situation.

- Network owners believe regulation like the bills proposed by net neutrality advocates will impede U.S. competitiveness by stifling innovation and hurt customers who will benefit from ‘discriminatory’ network practices. U.S. Internet service already lags behind other nations in overall speed, cost, and quality of service, adding credibility to the providers’ arguments. Obviously, by increasing the cost of heavy users of network bandwidth, telecommunication and cable companies and Internet service providers stand to increase their profit margins.

4. Are you in favor of legislation enforcing network neutrality? Why or why not?

- Student answers will vary. Some components and principles to consider in answering this question include:

- Price differentials: How much more would heavy bandwidth users pay than those who consume less bandwidth?

- Speed: How much faster would network transmissions be with a tiered service model?

- Stifle innovation: Would a tiered service model stifle innovation by charging more for heavy bandwidth use or would it free up bandwidth thus allowing more innovation?

- Censorship: Would telecommunication and cable companies and Internet service providers increase censorship of content transmitted over networks?

- Discrimination by carriers: Would the end of network neutrality be the beginning of more discrimination?
1. Define a LAN, and describe its components and the functions of each component?

   • A LAN is a telecommunications network that is designed to connect personal computers and other digital devices within a half-mile or 500-meter radius.
   • LANs typically connect a few computers in a small office, all the computers in one building, or all the computers in several buildings in close proximity. LANs require their own dedicated channels.
   • Components of a typical LAN consist of:
     - Computers (dedicated server and clients),
     - a network operating system (NOS) residing on a dedicated server computer,
     - cable (wiring) connecting the devices,
     - network interface cards (NIC), switches or a hub, and a router.

2. Name and describe the principal network topologies.

   • The principal network topologies include:
     - **Star topology**: All devices on the network connect to a single hub and all network traffic flows through the hub.
     - **Bus topology**: One station transmits signals, which travel in both directions along a single transmission segment. All of the signals are broadcast in both directions to the entire network, with special software to identify which components receive each message.
     - **Ring topology**: Connects network components in a closed loop. Messages pass from computer to computer in only one direction around the loop and only one station at a time may transmit.

3. Explain how the Domain Name System (DNS) and IP addressing system work.

   • The Internet is based on the TCP/IP networking protocol suite. Every computer on the Internet is assigned a unique Internet Protocol (IP) address.
   • A domain name is the English-like name that corresponds to the unique 32-bit numeric IP address for each computer connected to the Internet.
   • The Domain Name System (DNS) converts IP addresses to domain names so that users only need to specify a domain name to access a computer on the Internet instead of typing the numeric IP address.
   • DNS servers maintain a database containing IP addresses mapped to their corresponding domain names.

4. List and describe the principal Internet services.

   • **E-mail**: person-to-person messaging; document sharing.
   • **Newsgroups**: discussion groups on electronic bulletin boards.
   • **Chatting and instant messaging**: interactive conversations.
   • **Telnet**: logging on to one computer system and doing work on another.
   • **File Transfer Protocol (FTP)**: transferring files from computer to computer.
   • **World Wide Web**: retrieving, formatting, and displaying information (including text, audio, graphics, and video) using hypertext links.

- Standards for wireless computer networks include Bluetooth (802.15) for small personal-area networks (PANs), Wi-Fi (802.11) for local-area networks (LANs), and WiMax (802.16) for metropolitan-area networks (MANs).

- Bluetooth can link up to eight devices within a 10-meter area using low-power, radio-based communication and can transmit up to 722 Kbps in the 2.4 GHz band.

- Wi-Fi is useful for creating wireless LANs and for providing wireless Internet access. Its access range is limited to anywhere between 300 feet and three miles.

- WiMax has a wireless access range of up to 31 miles and a data transfer rate of up to 75 Mbps, making it suitable for providing broadband Internet access in areas lacking DSL and cable lines.

- 3G is a short term for third-generation wireless technology, especially mobile communications.

- 4G is short term for fourth-generation wireless technology. It is entirely packet switched and capable of 100 Mbps transmission speed (which can reach 1 Gbps under optimal conditions), with premium quality and high security.

6. Describe the capabilities of each and for which types of applications each is best suited.

- **Bluetooth**: Access very limited; useful for creating small personal-area networks.

- **Wi-Fi**: Access is limited to 30 to 50 meters; useful for creating small local area networks

- **WiMax**: Access is limited to a range up to 31 miles; useful for creating wide area networks

- **3G networks**: Access is available on major cellular telephone carriers that have configured their networks for 3G services.

- **4G networks**: It provides premium quality for voice, data, and streaming video from cellular telephone carriers.