Name: _____

Student ID: _____

Score: _____

Multiple Choice Questions ($12 \times 0.75 = 9$)

1. The Internet model consists of _____ layers.
   a. Three
   b. Five
   c. Seven
   d. Eight
2. To deliver a message to the correct application program running on a host, the _____ must be consulted.
   a. port
   b. IP
   c. physical
   d. none of the above
3. In _____ resolution, the DNS resolver expects the server to supply the final answer.
   a. iterative
   b. recursive
   c. straight
   d. none of the above
4. The path from Host A and Host B has four links of rates R1 = 750 kbps, R2 = 1500 kbps, R3 = 150 Mbps, R4 = 10 Gbps. If R4 drops to 0.5 Mbps, what is the throughput of the path?
   a. 500 kbps
   b. 750 kbps
   c. 1.5 Mbps
   d. none of the above
5. What is the correct ordering of the Internet protocol stack?
   a. Application, Presentation, Session, Transport, Network, Link, Physical
   b. Application, Network, Link, Transport, Physical
   c. Application, Transport, Network, Link, Physical
   d. Presentation, Session, Application, Link, Network, Transport, Physical
6. Consider different activities related to email.
   i: Send an email from a mail client to a mail server
   ii: Download an email from mailbox server to a mail client
   iii: Checking email in a web browser
   Which is the application level protocol used in each activity?
   a. i: HTTP, ii: SMTP, iii: POP
   b. i: SMTP, ii: POP iii: HTTP

c. i: SMTP, ii: FTP, iii: HTTP
d. i: POP ii: SMTP iii: IMAP

7. Which of the following statement is incorrect?
   a. DSL modem uses the existing telephone line to exchange data with a digital subscriber line access multiplexer (DSLAM)
   b. In DSL, the analog signals from many such houses are translated back into digital format at the DSLAM
   c. DSL access is asymmetric
   d. The residential telephone line does not carry both data and traditional telephone signals simultaneously
8. Packet switching allows fewer users to use a network compared to circuit switching.
   a. True
   b. False
9. Which of the following statement is incorrect?
   a. PoPs (Point of Presence) exist in all levels of the hierarchy, except for the bottom (access ISP) level.
   b. In Multi-home, any ISP including for tier-1 ISPs may choose to multi-home, that is, to connect to two or more provider ISPs.
   c. To reduce cost, a pair of nearby ISPs at the same level of the hierarchy can peer.
   d. Internet Exchange Points (IXP) are operated by third party.
   e. None of the above
10. Which of the following statement is incorrect?
   a. Non-persistent HTTP requires 2 RTTs per object.
   b. In persistent HTTP, server closes connection after sending response.
   c. Web cache reduces traffic on an institution's access link.
   d. Cookie state information is kept at protocol end points.
11. When a user requests a Web page that consists of some text and nine images. Assume Persistent HTTP is used. For this page, the client will send one request message and receive ten response messages.
   a. True
   b. False
12. The type of domain that deals with edu, com, net, org, and other similar extensions, is called a
   a. Root DNS server
   b. Top-level DNS server
   c. Authoritative DNS server
   d. Local DNS server

Short Questions

13. **[1 point]** Identify the correct order in which the following actions take place in an interaction between a web browser and a web server.
   A. The web browser requests a webpage using HTTP.
   B. The web browser establishes a TCP connection with the web server.

C. The web server sends the requested webpage using HTTP.
D. The web browser resolves the domain name using DNS.

Answer: D B A C

14. **[1 + 0.5 = 1.5 points]** Consider sending a packet from a source host to a destination host over a fixed route. List the delay components in the end-to-end delay. Which of these delays are constant and which are variable?

The delay components are:

- processing delays
- transmission delays
- propagation delays, and
- queuing delays

All of these delays are fixed, except for the queuing delays, which are variable.

15. **[0.5 + 1 = 1.5 points]** A packet has a nodal delay of 160.05 milliseconds. It traveled 10 km on a medium with a propagation rate of 2×10^8 m/s and had a transmission rate of 50 kbps. Ignoring queuing delay and processing delay, what was the size of the packet? What would the nodal delay be if the packet was sent to a host 300 km away at a rate of 450 kbps with 1.5 milliseconds of queuing delay?

Part 1:

$$d_{nodal} = d_{proc} + d_{queue} + d_{prop} + d_{trans}$$

$$\Rightarrow \frac{160.05}{1000} = 0 + 0 + \frac{10 \times 1000}{2 \times 10^8} + \frac{L}{50 \times 1000}$$

$$\Rightarrow \frac{160.05}{1000} = \frac{1}{2 \times 10^4} + \frac{L}{50 \times 1000}$$

$$\Rightarrow \frac{L}{50 \times 1000} = \frac{160.05}{1000} - \frac{1}{2 \times 10^4}$$

$$\Rightarrow \frac{L}{50} = 160.05 - \frac{1}{20}$$

$$\Rightarrow \frac{L}{50} = 160$$

$$L = 8000\ bits$$

Part 2:

$$d_{nodal} = d_{proc} + d_{queue} + d_{prop} + d_{trans}$$
$$= 0 + 1.5\,ms + \frac{300 \times 1000}{2 \times 10^8}\,sec + \frac{8000}{450 \times 1000}\,sec$$
$$= 0 + 1.5\,ms + \frac{3}{2 \times 10^3}\,sec + \frac{8}{450}\,sec$$
$$= 0 + 1.5\,ms + \frac{3}{2}\,ms + \frac{8000}{450}\,ms$$
$$= 0 + 1.5\,ms + 1.5ms + 17.78ms$$
$$\cong 20.8\,ms$$

Packet size = 8000 bits
Second nodal delay = 20.8 milliseconds

16. **[2 points]** What is the DNS type in following DNS Resource Records?
    a. (foo.com, relay1.bar.foo.com, CNAME)
    b. (foo.com, mail.bar.foo.com, MX)
    c. (foo.com, dns.foo.com, NS)
    d. (relay1.bar.foo.com, 145.37.93.126, A)