1. (7 pt) Answer with T('true') or F('false') for the following statements.

T or F

F V a) Packet switching is most useful when the rate is close to a constant.

F V b) All application layer protocols are in ASCII format.

F V c) SMTP is a mail access protocol.

T F d) FTP uses an out-of-band data connection.

F V e) Internet has complexity in the core rather than edge of the network.

T V f) There are only two transport layer protocols in the Internet protocol stack.

T V g) Stateful protocols typically involve more memory and control overheads in order to keep and maintain states.

2. (3 pt) Which of the following is *not* correct to the question of 'why are there *many* protocols'?
(Ans: d)

(a) There is no need to make protocol complex unnecessarily with one big protocol
(b) To achieve a better performance in a certain setting
(c) To achieve different tasks
(d) Since one protocol can only achieve one task

3. (3 pt) Which of the following is *not* correct about layering?
(Ans: a)

(a) End host only implements end-to-end protocol layers such as application and transport layers
(b) It enables each layer to evolve independently from other layers
(c) Each layer implements a service relying on services provided by layer below
(d) It provides modularity making it simple to implement

4. (3 pt) Which of the following is *not* correct about protocol stack?
(Ans: c)

(a) Internet uses five protocol layers
(b) ISO/OSI model uses seven protocol layers
(c) Tasks of session and presentation layers of ISO/OSI model are done at transport layer in Internet
(d) layer N protocol communicates with layer N protocol

5. (3 pt) Which of the following is *not* true about port numbers in transport later (TCP/UDP) headers?
(Ans: a)

(a) A users (programmer) has to specify a source port number while destination port number is assigned automatically by operating system.
(b) The same destination port numbers can be used for two processes within a host at the same time.
(c) The same source port numbers can be used in different hosts.
(d) The same destination port numbers can be used in different hosts.

6. (3 pt) Which of the following application uses a reliable transport service?
(Ans: a)

(a) telnet
(b) nslookup
(c) traceroute
(d) ping

7. (3 pt) Which of the following is *not* a transport layer service?
(Ans: d)

(a) Flow control
(b) Reliable data transfer
(c) Congestion control
(d) Routing

8. (3 pt) Which of the following is *not* correct about circuit switching?
(Ans: b)

(a) Connection set-up has to be made initially
(b) Statistical Multiplexing can be used
(c) Once connection is set up, performance is guaranteed for the connection
(d) It does not have the overhead of packet header

TASK OF NETWORK LAYER. (LINK LAYER) ?

9. (3 pt) Which of the following is *not* correct about client-server architecture?
(Ans: d)

(a) A client initiates a communication
(b) A server is always on
(c) A server is well-known (i.e., clients know the servers' name and port number)
(d) A clients should end the session first

10. (3 pt) Which of the following is *not* implemented in your umkc mail server?
(Ans: d)

(a) SMTP client
(b) SMTP server
(c) IMAP server
(d) POP3 client

11. (3 pt) Which of the following is *not* correct about mail protocol?
(Ans: d)

(a) SMTP is used in sending emails from my outlook to my mail server
(b) SMTP is used between mail servers
(c) SMTP operates in a push mode
(d) SMTP is used in receiving emails from a mail server to my outlook

12. (15 pt) Suppose within your Web browser you click on a link to obtain a web page. The IP address for the associated URL is cached in your local host, so a DNS look-up is not necessary to obtain the IP address. Further suppose that the base web page associated with the link references five very small objects on the same server. Let *RTT0* denote the RTTs between the local host and one of the object. Assuming zero transmission time of the object, how much time elapses from when the client clinks on the link until the client receives the full web page with:

(a) Nonpersistent HTTP with no parallel TCP connections?

There will be total of 2 RTTs for each single operation, that is 1 RTT for establishing connection and 1 for fetching a single object.

∴ Total Time = 2 × (Base Web Page) + 2 (5 Objects) = 2 + 10 = 12 RTT

(b) Persistent HTTP without pipelining?

Here, 1 RTT will be required to establish the connection. And 1 RTT each for each subsequent objects.

∴ Total Time = 1RTT × (Establish Conn.) + 1RTT × (1 Base Web Page) + 1RTT × (5 Objects)

= 1 + 1 + 5 = 7 RTT

11. (8 pt) Which DNS RRs (resource records) are stored in which DNS servers? Place the following DNS in the right DNS servers. (Assume no caching is made on DNS servers after the initial setup.)

(a) Local DNS server
(b) Root DNS server
(c) TLD DNS server
(d) Authoritative DNS server
(e) An end host connected to umkc campus network

(Ans: d ✓) (www.google.com , www.l.google.com, CNAME)
(Ans: d ✓) (www.l.google.com, 164.233.167.99, A)
(Ans: d ✓) (google.com, smtp1.google.com, MX)
(Ans: d ✓) (smtp1.google.com, 164.233.167.20, A)
(Ans: c ✓) (google.com, ns1.google.com, NS)
(Ans: c ✓) (ns1.google.com, 164.233.167.10, A)
(Ans: a ✓) ('a-root-server', 198.41.0.4, A)
(Ans: b ✓) ('a-tld-server-for-.com', 205.178.187.13, A)

CHECK SLIDES (BOOK)

PG - 145.

12. (15 pt) Suppose two hosts, A and B are separated by 10,000 kilometers and are connected by a direct link of R=1 Mbps. Suppose the propagation speed over the link is $2*10^8$ meters/sec. Consider sending a file of 400,000 bits from Host A to Host B.
(a) Suppose the file is sent continuously as one big message. How long does it take to send the file, assuming it is sent continuously?
(b) Suppose now the file is broken up into 20 packets with each packet containing 20,000 bits. Suppose that each packet is acknowledged by the receiver and the transmission time of an acknowledgement packet is negligible. Finally, assume that the sender cannot send a packet until the preceding one is acknowledged. How long does it take to send the file?
(c) Calculate the bandwidth-delay product, $R*t_{prop}$. What does it mean? (Provide an interpretation of the bandwidth-delay product.)

Q12.

~~Assuming 0 Queueing Delay and 0 Nodal~~

Ans(a). Considering only transmission delay and propagation delay -

$$\text{Transmission Delay} = \frac{L \text{ (Length of Packet)}}{R \text{ (Bandwidth)}}$$

$$= \frac{400,000}{100,000} \text{ sec.} = 0.4 \text{ seconds.}$$

THE END

Now, $$\text{Propagation Delay} = \frac{d \text{ (Distance)}}{s \text{ (Propagating Speed)}}$$

$$= \frac{10,000 \times 1000}{2 \times 10^8} \text{ sec} = 0.05 \text{ seconds.}$$

(a) Continued . . . . .

Total Time Taken = Transmission Delay + Propagation D

= 0.4 + 0.05

= 0.45 ✓ seconds.

2.12

b) Assuming there is no error, So the total time =

(Transmission Delay of 20 data pacs) + (Propagation Delay of 20 data pacs)

+ (Propagation Delay of 19 Ack pacs).

Now, Transmission Delay $= \frac{L}{R} = \frac{20,000}{100,000}$ sec $= 0.02$ sec.

Propagation Delay $= \frac{d}{s} = \frac{10,000 \times 1000}{2 \times 10^8}$ sec $= 0.05$ sec

The propagation delay is independent of the packet size so it will be same for 1 data packet and 1 Ack packet.

∴ Total Time $= 20 \times 0.02 + 20 \times 0.05 + 19 \times 0.05$

$= 0.40 + 1 + 0.95$

$= 2.35$ ✓ seconds.

2.12 c) Bandwidth Delay Product - It denotes the maximum amount ✓ of data that can be present in a network at a particular moment of time.

Bandwidth Delay Product $= R \times t_{prop} = 1 \text{ Mbps} \times 0.05 \text{ sec} = 10^3 \times 0.05$ Kb

R: Bandwidth ← ; t_{prop}: Propagation Delay ↓

$= 50$ Kb ✓