Midterm Practice Exam

1. What transport-layer protocol is connection-oriented?
    a. UDP
    b. TCP

2. SMTP uses 7-bit ASCII
    a. True
    b. False

3. An organization has a computer named mail.uark.edu that runs the mail server. Which type of DNS resource record is required so that this server can serve an email addressed to username@uark.edu?
    a. MX
    b. A
    c. NS
    d. CNAME

4. A web browser can decide to reject cookies from the web server.
    a. True
    b. False

5. What layer(s) in the Internet protocol stack does NOT have to be processed by a router?
    a. application and transport
    b. network, link, and physical
    c. physical
    d. link
    e. network

6. What transport-layer protocol has congestion control?
    a. UDP
    b. IP
    c. ICMP
    d. TCP

7. Where is TCP defined?
    a. RFC
    b. OSI specification
    c. Internet Standard Operating
    d. Internet Protocol Stack reference manual
    e. Network Working Group

8. What unique number is assigned to each process and is used to keep track of transport layer sessions when the process communicates?
    a. IP address
    b. port number
    c. socket number
    d. sequence number

9. [Multiple Answer Question] Which of the following characteristics apply to both SMTP and HTTP1.0?
    a. Has ASCII command/response interaction and status codes.
    b. Operates mainly as a “client pull” protocol.
    c. Can use a persistent TCP connection to transfer multiple objects.
    d. Uses a blank line (CRLF) to indicate the end of the request header.
    e. Works on top of TCP.

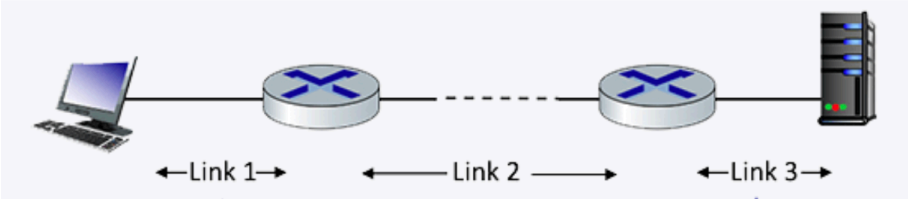
10. Which of the following is a false statement about packet switching?
    a. Routers must maintain state information for each connection.
    b. A header is always added.
    c. The next hop along the path may change for different packets from the same source to destination.
    d. Packet switching cannot control delay as easily as circuit switching.

11. Which of the following physical layer technologies has the highest transmission rate and lowest bit error rate in practice?
    a. Fiber optic cable
    b. Coaxial cable
    c. Twisted pair (e.g., CAT5, CAT6)
    d. 802.11 Wi-Fi Channel
    e. 4G/5G cellular

12. What layer in the network stack best corresponds to the phrase: “handles the delivery of segments from the application layer, may be reliable or unreliable”?
    a. Application
    b. Transport
    c. Network
    d. Link
    e. Physical

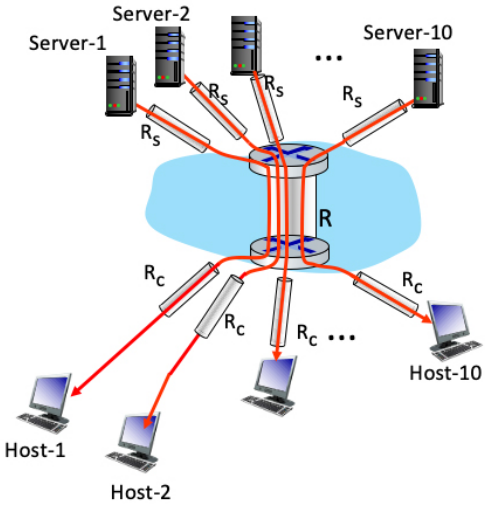
13. Compute the Internet checksum value for these two 16-bit words: 00000101 01111010 and 10111000 00100011
    a. 10111101 10011101
    b. 01000010 01100010
    c. 10011111 00001111
    d. 01000010 10011101

14. Consider the network shown in the figure below, with three links, each with a transmission rate of 1 Mbps and a propagation delay of 1 millisecond (msec) per link. Assume a packet is 1000 bits long.



    What is the end-end delay of a packet from when it first begins transmission on link 1, until is it received in full by the server at the end of link 3 (assume store-and-forward packet transmission)?
    a. 1 msec
    b. 2 msec
    c. 3 msec
    d. 6 msec
    e. 12 msec

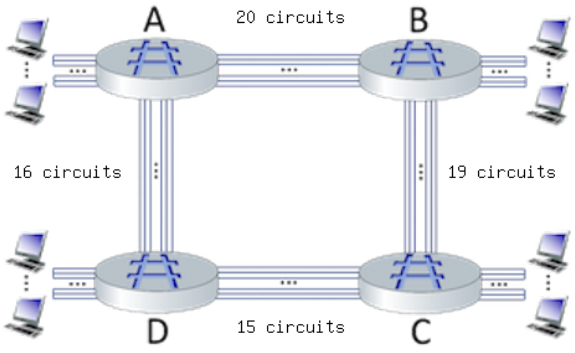
15. Consider the scenario shown below, with 10 different servers (four shown) connected to 10 different clients over ten three-hop paths. The pairs share a common middle hop with a transmission capacity of R = 200 Mbps. Each link from a server to the shared link has a transmission capacity of R_S = 25 Mbps. Each link from the shared middle link to a client has a transmission capacity of R_C = 50 Mbps.



What is the maximum achievable end-end throughput (in Mbps, give an integer value) for each of the ten client-to-server pairs, assuming that the middle link is fairly shared, and all servers are trying to send at their maximum rate?

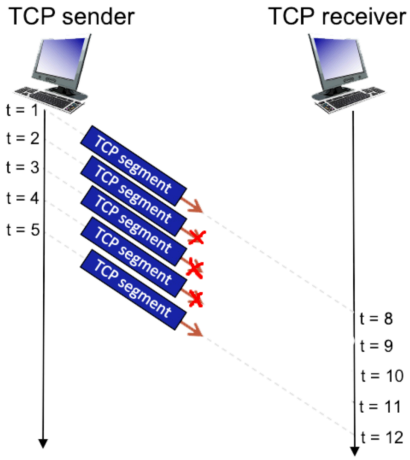
a. 20 Mbps
b. 275 Mbps
c. 50 Mbps
d. 200 Mbps
e. 25 Mbps

16. Consider the circuit-switched network shown in the figure below, with four circuit switches A, B, C, and D. Suppose there are 20 circuits between A and B, 19 circuits between B and C, 15 circuits between C and D, and 16 circuits between D and A. What is the maximum number of connections that can be ongoing in the network at any one time?



a. 70
b. 20
c. 16
d. 39
e. 31

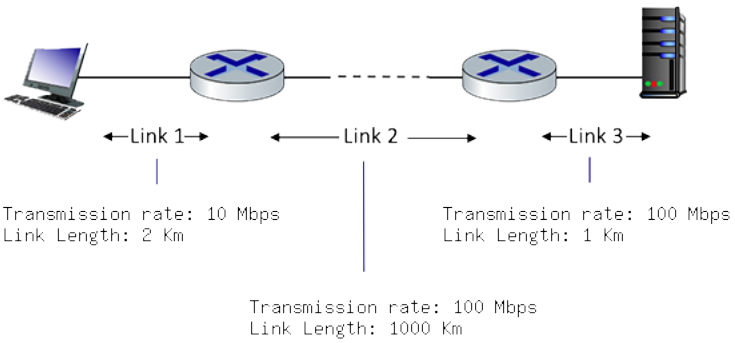
17. Consider the figure below, in which a TCP sender and receiver communicate over a connection, and the sender-to-receiver segments may be lost. The TCP sender sends an initial window of 5 segments. Suppose the initial value of the sender-to-receiver sequence number is 0, and the first 5 segments each contain 100 bytes. The delay between the sender and receiver is 7 time units, so the first segment arrives at the receiver at t = 8. As shown in the figure below, 3 of the 5 segment(s) are lost between the segment and receiver.



What ACK number does the receiver send in response to the 5th segment?

a. 0
b. 100
c. 200
d. 300
e. 400
f. 500

18. Consider the network shown in the figure below, with three links, each with the specified transmission rate and link length. Assume the size of a packet is 8000 bits. The speed of light propagation speed on each link is $3x10^8$ m/sec. What is the propagation delay along link 2?



a. 0.0033 seconds
b. 0.33 seconds
c. 3×10^8 seconds
d. 3 seconds