NAME: _____ *221 Points Possible*

1. (4 points each)
Give a short definition of the following (for acronyms, tell both what the acronym stands for and how it is used in networking).

(A) IEEE 802.3

(B) ARP

(C) CIDR

(D) Latency

(E) 2D Parity

(F) 100BaseT

(G) CSMA/CD

(H) Congestion Control

(I) Admission Control

(J) SMTP

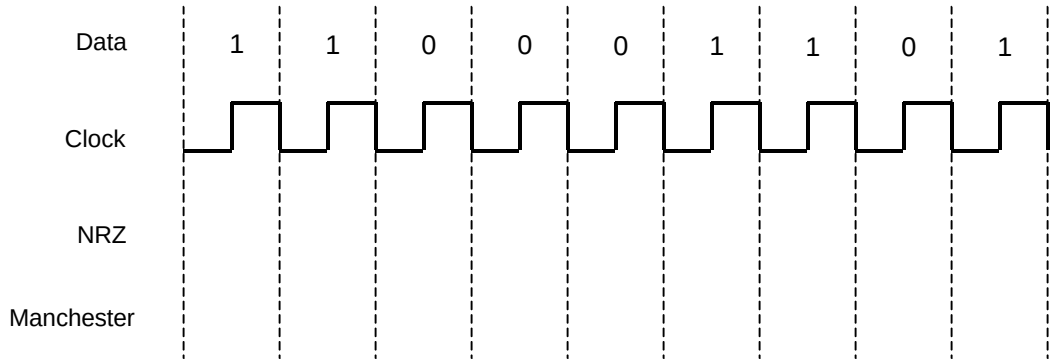
(K) RTT

2. (10 points each)

(A) Assume an application sends a 16-byte message. Sketch the packet/segments that would be formed at each network protocol layer for a TCP/IP-over-10BaseT network. (You are not required to identify individual fields, but packet/segment lengths and padding must be shown correctly.)

(B) Same as (A), but with an ATM/AAL5 network. (You need only show the formats for the levels that are different)

3. (3 points each)
Encode the bit string '110001101' using:
(A) NRZ
(B) Manchester encoding

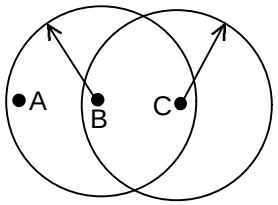


4. (12 points)
A color camera on a spacecraft sends 3 bytes per pixel and produces pictures with a resolution of 100 pixels per inch horizontally and vertically. The radio downlink to Earth has a bandwidth of 2.4Mbps. If the spacecraft is 15,000Km from Earth, how long will it take to send a 10" x 10" image?

5.
(A) (8 points) List the steps of the Ethernet MAC transmit algorithm.

(B) (5 points) What are the possible backoff times for the first two rounds of exponential backoff in a 10BaseT network?

6. (4 points each)
For the IEEE 802.11 network segment diagrammed below, list the events that would happen in the situations below:



(A) A and C both request to send to B at exactly the same time.

(B) A requests to send to B. Before B can respond to A, C requests to send to B.

7.
(A) (10 points) For each of the following IP addresses, show what class the address comes from, the maximum number of networks allowed in this class, and the maximum number of hosts per network in this class. Assume standard "classful" addressing without subnetting. You may express answers as a power of 2 where appropriate.

IP Address	***Class***	***Max # of Networks in this class***	***Max # hosts per network in this class***
4.14.250.250			
221.104.16.0			
170.0.0.0			

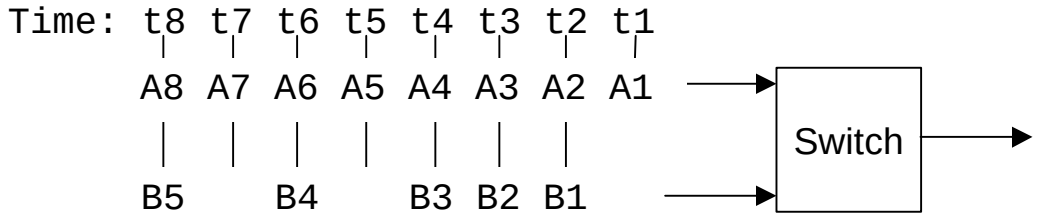
(B) (5 points) A host has the IP address 128.75.6.80 and the Subnet mask 255.255.255.192. What is the host's subnet number? (show your answer using dotted-decimal notation).

8. (6 points each)
(A) What part of the Basic Sliding Window Algorithm implements Flow Control?

(B) What part of the Basic Sliding Window Algorithm guarantees delivery?

(C) What augmentation is made in the TCP Sliding Window Algorithm to allow for wide variation in RTT?

9. (4 points each)
The figure shows a 2-input store-and-forward switch. The packet streams A1 – A5 and B1 – B5 are arriving on the inputs as shown. (Note that the order that the packets arrive at the switch is: A1, B1 and A2, B2 and A3, etc.) List the packets in order they would be sent out of the switch if:



(A) The switch uses Priority queuing (assume B's are higher priority).

(B) The switch uses Fair queuing

(C) The switch uses Weighted Fair Queuing (Channel A weight =2, Channel B weight=1)

10. (3 points each) True or False:
    (a) ___ The primary difference between QoS networks and conventional networks is that QoS networks can ensure that a message will always be delivered.
    (b) ___ A FlowSpec specifies the kind of service a sender needs in a QoS network.
    (c) ___ Random Early Deletion (RED) is a technique that could be used for QoS Policing.
    (d) ___ Differentiated Services networks do not require special routers.
    (e) ___ FTP runs on UDP.
    (f) ___ Huffman Encoding is an example of a lossless data compression technique.
    (g) ___ RLE is a good technique to use to compress plaintext.
    (h) ___ MIME could be used as a compression technique.
    (i) ___ JPEG is a good technique when image sharpness is required.

11. (3 points each) Multiple Choice:
    (A) ___ Secret Key encryption systems have:
        (a) 2 different keys
        (b) A single key
        (c) they do not use keys

    (B) ___ DES depends on the following technique(s) to make code-breaking difficult:
        (a) Long keys
        (b) The difficulty of factoring large numbers
        (c) Both
        (d) Neither.

    (C) ___ A Public-Key system encrypts data using:
        (a) The Public Key
        (b) The Secret Key
        (c) The Symmetric Key,
        (d) None of the above.

    (D) ___ Authentication in a Secret-Key system can be performed by means of:
        (a) A Two-way handshake
        (b) A firewall
        (c) A Certificate Server
        (d) None of the above

    (E) ___ The primary difference between POP3 and IMAP4 is that in IMAP4, mail is not automatically:
        (a) Forwarded
        (b) Deleted
        (c) MIME-encoded
        (d) None of the above.

    (F) ___ HTTP 1.1 uses:
        (a) Non-persistent connections
        (b) Persistent Connections
        (c) Both
        (d) Neither.

(G) ___ DNS and HTTP both use:
(a) Persistent connections
(b) Caching
(c) HTML
(d) All of the above.

(H) ___ GIF is a lossless image compression technique only if the image has:
(a) Many long runs of symbols.
(b) A "structured" background.
(c) Adjacent pixels are "similar".
(d) None of the above.

(I) ___ To improve efficiency, MPEG video takes advantage of the fact that:
(a) colors are generally consistent from frame to frame.
(b) the overall background is generally consistent from frame to frame.
(c) Neither of these.

(J) ___ The compression ratio proved by MP3 is:
(a) 4:1
(b) 10:1
(c) 12:1
(d) variable

12. (4 points each)
For the string: "AAAABBBCAAAABBCC":
(A) Show the RLE-compressed version of the string.

(B) Show a possible Huffman encoding of the symbols A, B, C, and D (you do not need to show the entire string).

(C) Show the encoding using the DPCM technique we discussed in class.

(D) Call each group of 4 characters a "word". Show an LZ dictionary and encoding of the message using these "words".