Problem 1: (14 points; 10 minutes) Give very short answers to the following:

(1) True or False: Reservation eliminates all collisions
(2) True or False: Error Correction cannot recover from missing packets but ARQ can
(3) Fill in the blank: DHCP is used for ——
(4) True or False: ATM runs over IP
(5) Fill in the blank: ——— includes the full path in every packet
(6) True or False: FDDI is a reservation protocol
(7) True or False: 802.11 wireless MAC supports both reservation and contention

Problem 2: (20 points; 15 minutes) For four of the following alternatives, state one advantage and one disadvantage relative to the other

(1) Go-Back-N and Selective Repeat
(2) Aloha and the Ethernet MAC protocol
(3) Virtual Circuit and Datagram Switching
(4) 4b/5B and NRZI
(5) Level 2 and Level 3 Switching

Problem 3: (21 points; 15 minutes)

(1) In the count based framing approach, is byte stuffing (i.e., using escape characters) necessary? Explain
(2) What happens if two machines get erroneously assigned the same IP address on the same network (Hint: think about what happens in ARP).
(3) What do contention based protocols do to handle high load? What can reservation based protocols do to handle low load?

Problem 4: (30 points; 25 minutes) Show an example to illustrate the following.

(1) A sequence number space of 3 (0 up to 2) not being sufficient for a sliding window with window size 2
(2) Learning bridges being more efficient than repeaters
(3) Forward Error Correction outperforming ARQ and vice versa
(4) Carrier Sense (CSMA) and Collision Detection (CD) being beneficial
(5) Path MTU discovery preventing fragmentation

Problem 5: (15 + 5 bonus; 20 minutes)

(a) (6 points) Give two examples of using timers or TTL fields in network protocols. Explain the tradeoff involved in picking the timer value for each (what happens if its too high; what happens if its too low)

(b) (6 points) Show a situation where spanning tree algorithm can cause a loop in the network. All the bridges have to behave correctly (according to the learning bridge/spanning tree algorithm rules)

(c) (3 + 5 bonus) To replace the spanning tree algorithm in 802.1, consider the following alternative: Every packet gets marked with the id of the bridges it passes through. If a bridge sees that a new packet already has its id, it drops it. Discuss whether the idea will work and what advantages/disadvantages it has over spanning tree.