Solutions to Homework#1

1. 

Bits
NRZ
Clock
Manchester
NRZI

5. The stuffed bits (zeros) are in bold:
1101 0111 1100 1011 1110 1010 1111 1011 0

26. If the receiver delays sending an ACK until buffer space is available, it risks delaying so long
that the sender times out unnecessarily and retransmits the frame.

33. In the following, ACK[N] means that all packets with sequence number less than N have been
received.
1. The sender sends DATA[0], DATA[1], DATA[2]. All arrive.

2. The receiver sends ACK[3] in response, but this is slow. The receive window is now DATA[3]. DATA[5].

3. The sender times out and resends DATA[0], DATA[1], DATA[2]. For convenience, assume DATA[1] and DATA[2] are lost. The receiver accepts DATA[0] as DATA[5], because they have the same transmitted sequence number.

4. The sender finally receives ACK[3], and now sends DATA[3]-DATA[5]. The receiver, however, believes DATA[5] has already been received, when DATA[0] arrived, above, and throws DATA[5] away as a “duplicate”. The protocol now continues to proceed normally, with one bad block in the received stream.

42. (a) Assuming 48 bits of jam signal was still used, the minimum packet size would be 4640+48 bits = 586 bytes.

(b) This packet size is considerably larger than many higher-level packet sizes, resulting in considerable wasted bandwidth.

(c) The minimum packet size could be smaller if maximum collision domain diameter were reduced, and if sundry other tolerances were tightened up.