

CSci 327

Mid-Term Test (Sample)

Computer Science Department

University of North Dakota

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I Short Answers

- (1) {10} What are the three goals for modern Internet to achieve?
- (2) {10} What is the reason to have services and mechanisms in the layered design?
- (3) {10} What is the main functionality of the transport layer in the 7-layer OSI model?
- (4) {10} What are the two main service models used in the Internet? Which one is the fundamental service model used in modern Internet?
- (5) {10} Explain the three multiplexing methods: TDMA, FDMA, and STDMA.
- (6) {10} What are the four components of a network delay?
- (7) {10} Explain the purpose of the 4B/5B block coding scheme. (i.e., what the 4B/5B scheme can do to us?)
- (8) {10} Explain the format and usage of the Network Hardware Address (i.e., the MAC address).
- (9) {10} Explain the meaning of the maximum capacity of a channel.
- (10) {10} Explain the relative difficulty of error detection and error correction.
- (11) {10} Explain the meaning of the signal levels and the Nyquist bit rate.

II Multiple Choices (Single correct answer)

2. (Switch & virtual circuit) In the network shown in Figure 1, a forwarding item in the virtual circuit table is established at each switch along a path going from the sending host to the receiving host of a connection. Assume that the sequence of connections that the sequence of connections is cumulative, also assume that the VCI assignment always picks the lowest unused VCI on each link, starting with 0. Answer the following questions.

(i) {5 points} When the virtual circuit tables are given in Table 1, what is the sequence of connections which results in the given tables?

- (a) G -> C, C -> G, D -> I, B -> F;
- (b) C -> G, G -> C, I -> D, F -> B;
- (c) G -> C, C -> G, I -> D, F -> B;
- (d) C -> G, G -> C, D -> I, B -> F;
- (e) None of the above.

(ii) {10 points} When the current virtual circuit tables are given in Table 1 and the forwarding information for a new connection F -> A is to be established in the virtual circuit tables, what is the possible forwarding information for this connection in the virtual circuit table at switch S2?

S1				S2			
In Port	In VCI	Out Port	Out VCI	In Port	In VCI	Out Port	Out VCI
1	0	3	0	1	0	3	0
3	1	1	0	3	0	1	0
0	0	1	1	3	1	0	0
				0	0	1	1

S3				S4			
In Port	In VCI	Out Port	Out VCI	In Port	In VCI	Out Port	Out VCI
0	0	2	0	1	0	3	0
3	0	0	0	3	0	1	0
				3	1	2	0

Table 1: Forwarding Tables

- (a) 1 | 5 || 3 | 2;
- (b) 1 | 1 || 3 | 1;
- (c) 1 | 4 || 3 | 4;
- (d) 1 | 2 || 3 | 0;
- (e) None of the above.

III Other Questions

1. (CRC Error Detection) Given the dataword 101001111000 and the divisor 00110111. Answer the following questions:

(i) {10 points} Show the generation of the codeword at the sender side.

(ii) {10 points} When this codeword arrives at the receiver side, it is in the form of 10100100010000000 due to channel errors. Whether the receiver will accept it or ignore it?

2. What is the theoretical capacity of a channel with its bandwidth of 1 MHz and SNRdB = 20?

3. What is the total delay (latency) for a frame of size 5 million bits that is being sent on a link with 10 routers each having a queuing time of 2 gs and a processing time of 1 gs. The length of the link is 2000 Km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 5 Mbps. Which component of the total delay is dominant? Which one is negligible?

4. Draw the graphs of the NRZ-I, Manchester, and differential Manchester schemes using the data stream 00110011, assuming that the last signal level has been positive.