CMPS 3620 **Name (Print):** _____
Spring 2018
Midterm II
4/2018
Time Limit: 150 minutes Instructor A. Cruz

This exam contains 7 pages (including this cover page) and 6 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or any computer/cell phone/tablet/etc. on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- **You are allowed to have one cheat sheet**. You may write on both sides. The paper must be 8.5x11 inches. You must turn in your cheat sheet at the end of the test. It must have your name on it.
- **An ID is required**. You will not be able to turn in the test unless you show a photo ID.
- **Mysterious or unsupported answers will not receive full credit**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.

Problem	Points	Score
1	10	
2	8	
3	22	
4	7	
5	10	
6	9	
Total:	66	

Do not write in the table to the right.

1. The following question pertains to CRC checksums.

   (a) (3 points) Consider the following generator: $x^2 + 1$. Given the following bit sequence: `1011`, what is the CRC checksum value?

   (b) (3 points) Consider the following generator: $x^2 + 1$. Given the following bit sequence: `1110111`, is there an error?

   (c) (3 points) Consider the following generator: $x^5 + x^2 + x + 1$. Given the following bit sequence: `101110111`, what is the CRC checksum value?

   (d) (1 point) Consider the following generator: $x^5 + x^2 + x + 1$. Given the following bit sequence: `10111011100101`, is there an error?

2. The following questions pertain to ALOHA and slotted ALOHA.

   (a) (2 points) The equation of a Poisson distribution is:

   $$P(k) = \frac{G^k e^{-G}}{k!}$$

   In a given time frame, what is the probability that 3 frames are generated in a time frame where 10 frames are expected?

   (b) (3 points) Explain why the vulnerability window for pure ALOHA is Ge^{-2G}.

   (c) (3 points) What is the throughput of slotted ALOHA if we anticipate 50 other frames in the time slot?

3. The following are true or false questions about wireless communication. Write true or false.

   (a) (1 point) _____ The IEEE standard for wireless is IEEE 802.3.

   (b) (1 point) _____ 802.11 uses radio.

   (c) (1 point) _____ Generally, a wireless host cannot send and sense at the same time.

   (d) (1 point) _____ Wireless has a pre-backoff before sending, and a post-backoff from collisions.

   (e) (1 point) _____ 802.11 frames must be encrypted.

   (f) (1 point) _____ 802.11a was released before 802.11b.

   (g) (1 point) _____ The hidden terminal problem is when a host sees a frame being sent but it cannot tell who the recipient is.

   (h) (1 point) _____ The length of time to send data after a CTS is fixed.

   (i) (1 point) _____ After a successful RTS and CTS frame, the channel is seized.

   (j) (1 point) _____ Ad-hoc mode uses access points.

   (k) (1 point) _____ 802.11 frames headers contain three addresses.

   (l) (1 point) _____ A wireless access point/bridge requires an IP address.

   (m) (1 point) _____ Power spread spectrum allowed hosts to unevenly allocate bandwidth across difference channels.

   (n) (1 point) _____ With later 802.11 protocols, having more antennae leads to faster communication.

   (o) (1 point) _____ The 5Ghz wireless bands overlaps the fundamental frequency of water.

   The following questions are on Ethernet.

   (p) (1 point) _____ Gigabit Ethernet uses contention windows.

   (q) (1 point) _____ Older frames have priority.

   (r) (1 point) _____ A switch removes contention.

   (s) (1 point) _____ Gigabit Ethernet uses Manchester encoding.

   (t) (1 point) _____ Longer cables decrease channel efficiency.

   (u) (1 point) _____ Increasing the bandwidth decreases maximum cable length.

   (v) (1 point) _____ Increasing the speed of signal propagation decreases maximum cable length.

4. This question is about OSPF. Consider the following link state packets:

```
Router A: B - 1, C - 6
Router B: A - 1, D - 2
Router C: A - 6, D - 1, E - 5
Router D: B - 2, C - 1, F - 1
Router E: C - 5, F - 2
Router F: D - 1, E - 2
```

(a) (2 points) Give the graph of the network (not the sink tree yet).

(b) (3 points) Give the sink tree of the network from node C.

(c) (1 point) In what order are the nodes expanded?

(d) (1 point) C sends data to A. What path does it take?

5. This question is about OSPF. Consider the following link state packets:

```
Router A: B - 15, C - 10, G - 13
Router B: A - 15, C - 8
Router C: A - 10, B - 8, D - 20, E - 7
Router D: C - 20, E - 2, F - 16
Router E: C - 7, D - 2, F - 19
Router F: D - 16, E - 19, G - 20
Router G: A - 13, G - 20
```

(a) (3 points) Give the graph of the network (not the sink tree yet).

(b) (5 points) Give the sink tree of the network from node E.

(c) (1 point) In what order are the nodes expanded?

(d) (1 point) E sends data to G. What path does it take?

6. The following question is about IPV4 addresses.

   (a) (1 point) A subnet has 19 bits for the subnet mask. What is subnet mask, in IPV4 notation?

   (b) (2 points) Given the following IP address: `10.4.9.23/8`, what is the network address?

   (c) (2 points) Given the following IP address: `203.173.20.8/15`, what is the network address?

   (d) (4 points) Given the following IP addresses: `12.160.255.3/17` and `12.160.143.230/17`, are these two routers on the same subnet? Show your work.