Total: ____ / 105 points (cap at 100 points) = ____ CS 146B, Midterm Exam, Fall 2015

Name: _____ Date: _____

Pledge: _____

1. History (6 points) *First and last names are required.* [2 points each, spelling not important unless mistake is egregious]
   In addition to creating the A-0 compiler series, Grace Hopper popularized the term "computer bug" when a moth was discovered inside Mark 2.
   Credited as the main author of HTML, Tim Berners-Lee also led the creation of the World Wide Web.
   Donald Knuth wrote the series *The Art of Computer Programming,* which contains work on algorithms and the analysis of their complexity.

2. Networking Concepts and Vocabulary (10 points) [2 points each, spelling not important unless mistake is egregious]

   A router is essentially a piece of networking hardware with two built-in network addresses, one for the LAN and one for the WAN. Its purpose is to allow messages to be sent from one network to another.
   A hub is typically the least expensive, least intelligent, and least complicated piece of networking hardware. Its job is very simple – anything that comes in one port is sent out to the others.
   A switch is a piece of networking hardware that by paying attention to the traffic that comes across it, it can "learn" where particular addresses are.
   A socket is a combination of an IP address and a port number.
   A protocol is a set of rules governing the format and meaning of the packets, or messages that are exchanged by the peer entities within a layer.

3. List the seven layers of the OSI reference model from highest to lowest. (14 points) [2 points each, -1 for any item not in the correct place]
   Application
   Presentation
   Session
   Transport
   Network
   Data Link
   Physical

   Write the name of the layer in IPS that performs the following functions. (8 points) [2 points each]

Link	Provides connectivity functions
Application	Specific protocols based on functionalities and communication services
Transport	General framework to transmit data between hosts using protocols like TCP and UDP
Internet	Communication methods between multiple links of a computer Facilitates interconnection of networks

4. Convert 69_{10} to binary. (3 points) [-1 for each incorrect digit, up to 3] 1000101_2

   Convert 10100011_2 to hexadecimal. (3 points) [-1 for one incorrect digit, -3 if both are wrong] $A3_{16}$

5. How many bits are used in IPv6 addresses? (1 point) 128

   What purpose does IPv6 serve? (1 point) We have run out of IPv4 addresses, and the large address space of IPv6 should last a long time [currently trillions of addresses per person on Earth].

   Convert 124.56.178.89 to an IPv4-mapped IPv6 address. (3 points) [1 point for ::, 1 point for FFFF, 1 point for IPv4 address] ::FFFF:124.56.178.89 is the real answer; ::FFFF:7C38:B259 will be accepted

6. List the phases of the SDLC waterfall model in order. (12 points) [2 points each, wording should be close but not necessarily exactly 100% the same]
   Requirements gathering and/or analysis
   System design
   Implementation
   Integration and/or testing
   Deployment
   Maintenance

7. An IP address is 64.149.25.114/26. Answer the questions below. (12 points) [2 points each, all or nothing]

   What is the subnet mask? 255.255.255.192

   What is the network address? 64.149.25.64

   What is the broadcast address? 64.149.25.127

   How many hosts can be put on this network? 62

   How many /29 subnets can there be? 8

   How many hosts can there be in each /29 network? 6

8. The person at computer A (192.168.1.15/24) wishes to make a request to the HTTP server running on computer B on port 80 at 149.150.24.78. That IP address has been registered to magicmaker.com. Computer A is connected to a router whose WAN IP address is 65.37.120.34/16.

   When the person types www.magicmaker.com in his browser, what does computer A do first (assuming the answer is not in the hosts file)? (2 points) [1 point for DNS query, 1 point for recursive]
   Make a recursive DNS query to obtain the IP address of www.magicmaker.com.

Show the source and destination IP addresses of the HTTP request when it first leaves computer A. You may assume the source port is 54321. (4 points) [1 point for each IP address, 1 point for each port number]

```
Source:      192.168.1.15   : 54321
Destination: 149.150.24.78  : 80
```

Show the source and destination IP addresses of the HTTP request after it passes through the router. (4 points) [1 point for each IP address, 1 point for each port number]

```
Source:      65.37.120.34   : 54321
Destination: 149.150.24.78  : 80
```

9. List the 4 key components of a requirements document in order. (8 points) [2 points each]

Description of problem
Basic approach of solution
Constraints (time, budget, etc.)
How success will be measured (how do we know we're done?)

10. Write the code for an HTML5-compliant page that contains a paragraph with the text "Hello World". The page title should be "HTML5 Is Awesome". (14 points) [2 points for !DOCTYPE, html, head, meta, title, body, and p tags. If missing content, attribute, or closing tag, subtract 1 for that item. Meta tag does not require closing /.]

```
<!DOCTYPE html>
<html lang="en-US">
  <head>
    <meta charset="utf-8" />
    <title>HTML5 Is Awesome</title>
  </head>
  <body>
    <p>Hello World</p>
  </body>
</html>
```