Instructions - Try to do your homework on your own. Some of the questions will require additional thought. It is more important to have your own opinion on the problems and argue along, than copying from other persons’ answer sheet. You will get extra credit for good argument.

CHAPTER 4
1. (6pt) P. 402 Problem 29
   A subnet is a portion of a larger network; a subnet does not contain a router; its boundaries are defined by the router and host interfaces. A prefix is the network portion of a CDIRized address; it is written in the form a.b.c.d/x; A prefix covers one or more subnets. When a router advertises a prefix across a BGP session, it includes with the prefix a number of BGP attributes. In BGP jargon, a prefix along with its attributes is a BGP route (or simply a route).

2. (4pt) P. 403 Problem 33
   a) uncontrolled flooding: T; controlled flooding: T; spanning-tree: F
   b) uncontrolled flooding: T; controlled flooding: F; spanning-tree: F

3. (5pt) P. 403 Problem 34
   False
   IGMP is used between the hosts and their local router to join and leave multicast groups.

4. (5pt) P. 403 Problem 36
   In a group-shared tree, all senders send their multicast traffic using the same routing tree. With source-based tree, the multicast datagrams from a given source are routed over a specific routing tree constructed for that source; thus each source may have a different source-based tree and a router may have to keep track of several source-based trees for a given multicast group.
5. (11pt - 5, 6pt each) P. 405 Problem 7

a) Prefix Match

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Link Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>11100000</td>
<td>0</td>
</tr>
<tr>
<td>11100001 0000000</td>
<td>1</td>
</tr>
<tr>
<td>11100001</td>
<td>2</td>
</tr>
<tr>
<td>otherwise</td>
<td>3</td>
</tr>
</tbody>
</table>

Prefix match for first address is 4th entry: link interface 3
Prefix match for second address is 2nd entry: link interface 1
Prefix match for first address is 3rd entry: link interface 2

6. (10pt) P. 408 Problem 21

<table>
<thead>
<tr>
<th>Step</th>
<th>( N' )</th>
<th>( D(s),p(s) )</th>
<th>( D(t),p(t) )</th>
<th>( D(u),p(u) )</th>
<th>( D(v),p(v) )</th>
<th>( D(w),p(w) )</th>
<th>( D(y),p(y) )</th>
<th>( D(z),p(z) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>X</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>3,x</td>
<td>1,x</td>
<td>6,x</td>
<td>( \infty )</td>
<td>( \infty )</td>
</tr>
<tr>
<td>1</td>
<td>xw</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>4,w</td>
<td>2,w</td>
<td>6,x</td>
<td>( \infty )</td>
<td>( \infty )</td>
</tr>
<tr>
<td>2</td>
<td>xwv</td>
<td>( \infty )</td>
<td>11,v</td>
<td>3,v</td>
<td>3,v</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
</tr>
<tr>
<td>3</td>
<td>xwvu</td>
<td>7,u</td>
<td>5,u</td>
<td>3,v</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
</tr>
<tr>
<td>4</td>
<td>xwvuuy</td>
<td>7,u</td>
<td>5,u</td>
<td>17,y</td>
<td>7,t</td>
<td>7,t</td>
<td>( \infty )</td>
<td>( \infty )</td>
</tr>
<tr>
<td>5</td>
<td>xwvuut</td>
<td>6,t</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
</tr>
<tr>
<td>6</td>
<td>xwvuuyt</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
<td>( \infty )</td>
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</tbody>
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CHAPTER 5

7. (5pt) P. 493 Problem 3

There will be a collision in the sense that while a node is transmitting it will start to receive a packet from the other node.

8. (10pt - 5pt each) P. 494 Problem 5

a)

\[
E(p) = Np(1-p)^{N-1}
\]

\[
E'(p) = N(1-p)^{N-1} - Np(N-1)(1-p)^{N-2} = N(1-p)^{N-2}((1-p) - p(N-1))
\]

\[
E'(p) = 0 \Rightarrow p^* = \frac{1}{N}
\]
b)

\[ E(p^*) = N \left( 1 - \frac{1}{N} \right)^{N-1} = (1 - \frac{1}{N})^{N-1} = \frac{(1 - \frac{1}{N})^N}{1 - \frac{1}{N}} \]

\[ \lim_{N \to \infty} (1 - \frac{1}{N}) = 1 \quad \lim_{N \to \infty} (1 - \frac{1}{N})^N = \frac{1}{e} \]

Thus

\[ \lim_{N \to \infty} E(p^*) = \frac{1}{e} \]

9. (5pt) P. 496 Problem 11

At \( t = 0 \), \( A \) transmits. At \( t = 576 \), \( A \) would finish transmitting. In the worst case, \( B \) begins transmitting at time \( t = 224 \). At time \( t = 224 + 225 = 449 \) \( B \)'s first bit arrives at \( A \). Because \( 449 < 576 \), \( A \) aborts before completing the transmission of the packet, as it is supposed to do.

Thus \( A \) cannot finish transmitting before it detects that \( B \) transmitted. This implies that if \( A \) does not detect the presence of a host, then no other host begins transmitting while \( A \) is transmitting.