Name: __________________________
Are you a graduate student____ or an undergraduate student____

Department of Computer Science & Engineering
Wright State University

CEG 402/602 Fall 2002 Midterm

PROBLEM | POINTS | SCORE
---------|--------|------
  1      |  30    |      
  2      |  10    |      
  3      |  10    |      
  4      |  10    |      
  5      |  10    |      
  6      |  10    |      
  7      |  10    |      
 TOTAL   |  90    |      

2. Show all your work carefully for both full and partial credits.
3. Write clearly. Illegible writing will not be given credits.
4. You will be given credits only for what appears on your exam.

PLEDGE: No aid given, received, or observed.

Signature: ________________________________
1. (30 points, 5 points each) Briefly answer the following questions:
   
   a. What are connection-oriented services and connectionless services? Give an example of each.
   
   b. What are circuit switching and packet switching? Give an example of each.
   
   c. What is a network protocol? Give three examples.
   
   d. What are datagram networks and virtual circuit networks? Give an example of each.
e. Identify the components of delays that a packet may experience in packet-switched networks.

f. Briefly describe the 7-layer network model and layered model (or the protocol stack) of the Internet.

2. (10 points) A bit stream 10011101 is to be transmitted with CRC. Given the generator pattern, 1001, calculate the CRC bits.
3. (10 points) Show that the maximum efficiency of pure ALOHA is $1/2e$. You must give details to get credits.

4. In CSMA/CD, after the fifth collision, what is the probability that the value of $K$ that a node chooses is 4? The result $K=4$ corresponds to a delay of how many seconds on a 10 Mbps Ethernet?
5. (10 points) Consider the following network. With the indicated link cost, use Dijkstra’s algorithm to compute the shortest path from E to all other network nodes. You must show how the algorithm works by computing a table similar to Table 4.2 of the textbook.
6. (10 points) Consider the three-node network topology shown below. Compute the distance tables of each node after the initialization step and after each iteration of a synchronous version of the distance vector algorithm till the algorithm converges.
7. (10 points). Given the network topology below and link costs. Initially, link cost \( c(X,Y) = 4 \). Distance tables for destination X at node Y and Z are initially as follows.

<table>
<thead>
<tr>
<th>Y</th>
<th>X</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Z</th>
<th>X</th>
<th>Y</th>
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<tbody>
<tr>
<td>X</td>
<td>50</td>
<td>5</td>
</tr>
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</table>

If link cost \( c(X,Y) \) changes to 60 from 4. Show how reverse poison mechanism can be employed to make the algorithm converge fast. Show each iteration of the algorithm till the algorithm converges.