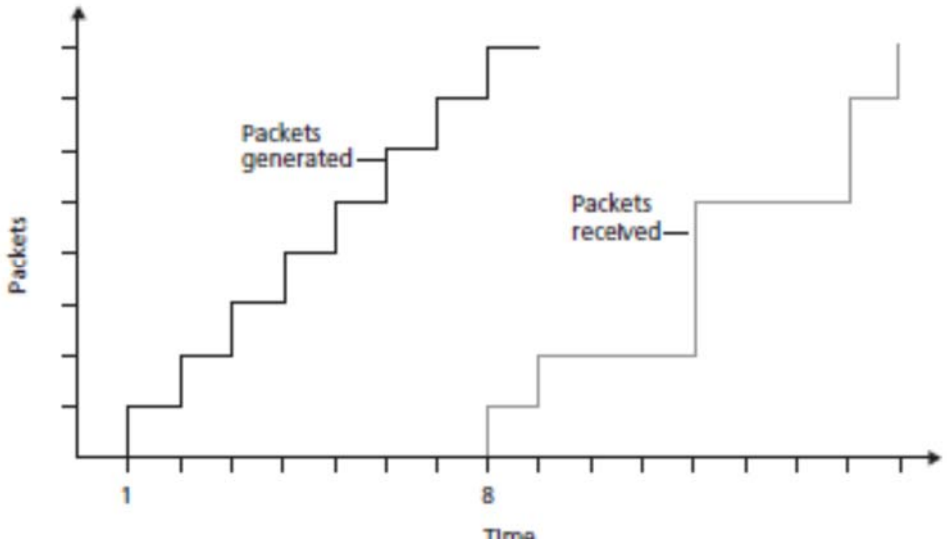
105 博士班資格考
科目：資訊網路
時間：4 小時 (Closed book)

Part I. (50 分)

1. What are the five layers in the Internet protocol stack? What are the principal responsibilities of each of these layers? (10%)
2. Compare the frame structures for 10BASE-T, 100BASE-T, and Gigabit Ethernet. How do they differ? (10%)
3. Consider an 8-block cipher. How many possible input blocks does this cipher have? How many possible mappings are there? If we view each mapping as a key, then how many possible keys does this cipher have? (10%)
4. Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 128.119.40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets? (10%)
5. Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A.
   a. In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number? (5%)
   b. If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number? (5%)

Part II. (50 分)

6. Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that n DNS servers are visited before your host receives the IP address from DNS; the successive visits incur an RTT of RTT1, . . ., RTTn. Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let RTT0 denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object? (10%)
7. Suppose there are two ISPs providing WiFi access in a particular café, with each ISP operating its own AP and having its own IP address block. a. Further suppose that by accident, each ISP has configured its AP to operate over channel 11. Will the 802.11 protocol completely break down in this situation? Discuss what happens when two stations, each associated with a different ISP, attempt to transmit at the same time. b. Now suppose that one AP operates over channel 1 and the other over channel 11. How do your answers change? (10%)
8. Consider the figure below (which is similar to Figure 7.7). A sender begins sending packetized audio periodically at t = 1. The first packet arrives at the receiver at t = 8.



a. What are the delays (from sender to receiver, ignoring any playout delays) of packets 2 through 8? Note that each vertical and horizontal line segment in the figure has a length of 1, 2, or 3 time units. (5%)

b. If audio playout begins as soon as the first packet arrives at the receiver at t = 8, which of the first eight packets sent will not arrive in time for playout? (5%)

c. If audio playout begins at t = 9, which of the first eight packets sent will not arrive in time for playout? (5%)

d. What is the minimum playout delay at the receiver that results in all of the first eight packets arriving in time for their playout? (5%)

9. Consider the two ways in which communication occurs between a managing entity and a managed device: request-response mode and trapping. What are the pros and cons of these two approaches, in terms of (1) overhead, (2) notification time when exceptional events occur, and (3) robustness with respect to lost messages between the managing entity and the device? (10%)