

國立雲林科技大學資訊管理系
109 學年度第 1 學期博士班資格考
科目：資訊網路

時間：4 小時 (Closed book)

作答時，請注意各題之比例配分，並清楚標示題號

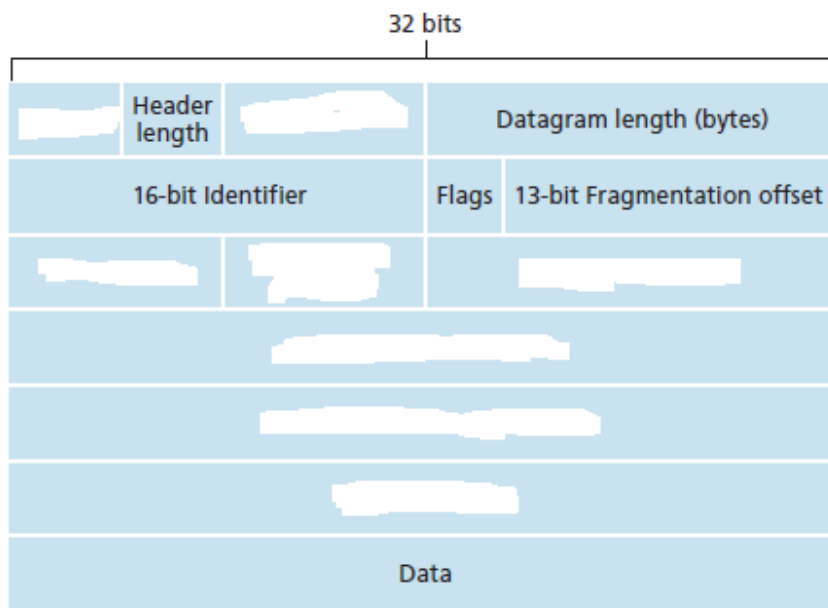
第一部分

● 50 分(共 5 題，每題 10 分)

1. List six access technologies. Classify each one as home access, enterprise access, or wide-area wireless access.
2. What are the seven message types used in SNMPv2?
3. Suppose the IEEE 802.11 RTS and CTS frames were as long as the standard DATA and ACK frames. Would there be any advantage to using the RTS and CTS frames? Why or why not?
4. Complete the following figure: their application-layer protocols and their underlying transport protocols for the popular Internet applications.

Application	Application-Layer Protocol	Underlying Transport Protocol
Electronic mail		
Remote terminal access		
Web		
File transfer		
Streaming multimedia		
Internet telephony		

5. Complete the following figure: IPv4 datagram format.



第二部分

● 50 分(3 選 2，每題 25 分)

1. a) Consider Figure 1. Suppose that all links are 100 Mbps. What is the maximum total aggregate throughput that can be achieved among the 9 hosts and 2 servers in this network? You can assume that any host or server can send to any other host or server. Why?
- b) Suppose the three departmental switches in Figure 1 are replaced by hubs. All links are 100 Mbps. Now answer the questions posed in problem a).
- c) Suppose that all the switches in Figure 1 are replaced by hubs. All links are 100 Mbps. Now answer the questions posed in problem a).

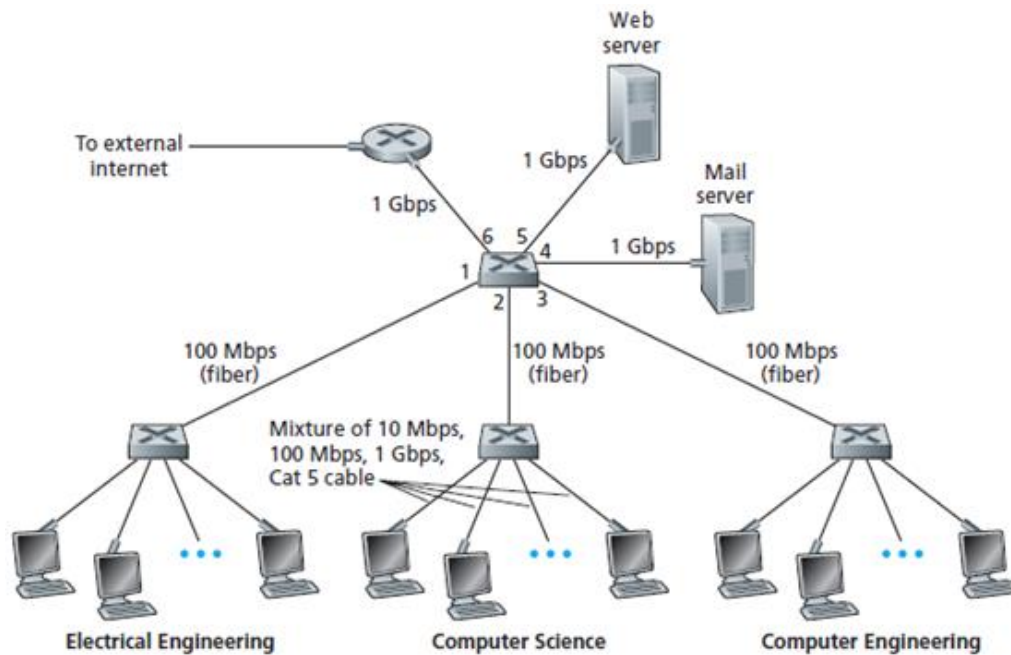


Figure | An institutional network connected together by four switches

2. a) The following True/False questions pertain to Figure 2.
 - I. When a host in 172.16.1/24 sends a datagram to an Amazon.com server, the router R1 will encrypt the datagram using IPsec.
 - II. When a host in 172.16.1/24 sends a datagram to a host in 172.16.2/24, the router R1 will change the source and destination address of the IP datagram.
 - III. Suppose a host in 172.16.1/24 initiates a TCP connection to a Web server in 172.16.2/24. As part of this connection, all datagrams sent by R1 will have protocol number 50 in the left-most IPv4 header field.
 - IV. Consider sending a TCP segment from a host in 172.16.1/24 to a host in 172.16.2/24. Suppose the acknowledgment for this segment gets lost, so that TCP resends the segment. Because IPsec uses sequence numbers, R1 will not resend the TCP segment.
- b) Consider the example in Figure 2. Suppose Trudy is a woman-in-the-middle, who can insert datagrams into the stream of datagrams going from R1 and R2. As part of a replay attack, Trudy sends a duplicate copy of one of the datagrams sent from R1 to R2. Will R2 decrypt the duplicate datagram and forward it into the branch-office network? If not, describe in detail how R2 detects the duplicate datagram.

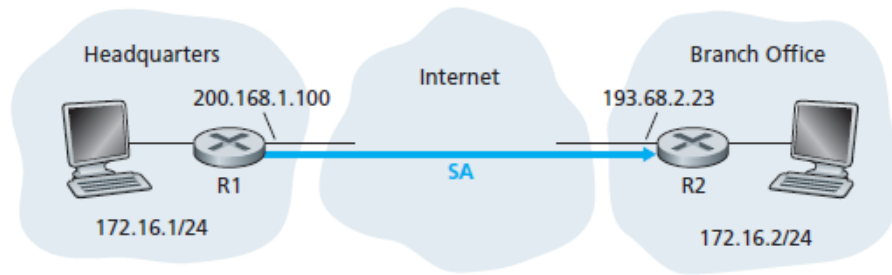


Figure 2 Security Association (SA) from R1 to R2

3. 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?
 - b. If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?
 - c. If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?
 - d. Suppose the two segments sent by A arrive in order at B. The first acknowledgment is lost and the second acknowledgment arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgments sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgment that you add, provide the acknowledgment number.