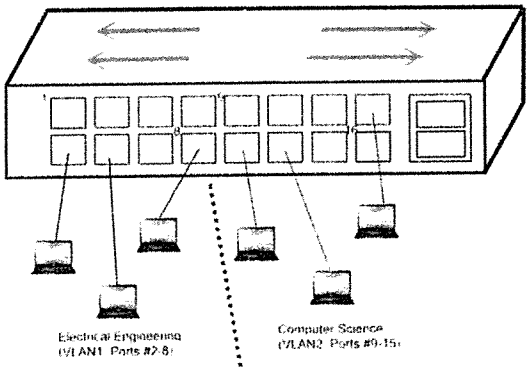
※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

1. Are the following statements correct? If yes, mark O, otherwise mark X. (A wrong answer will get negative (-2) score.) (2 points for each problem.) 14 %
   (a) The *Subnet mask* is used to identify the host within a network.
   (b) The maximum throughput of *ALOHA* is the double of that of *slotted ALOHA*.
   (c) BGP is an example of interior routing protocol.
   (d) Net neutrality is the principle that all online traffic should be treated equally regardless of the applications, types of attached equipment, or modes of communication.
   (e) A hub is a physical layer repeater ,and a switch is a store-and-forward device.
   (f) GSM is an analog system which uses combined FDM/TDM techniques to provide the voice service.
   (g) Wireshark is a packet sniffer (analyzer), which can be used for observing the protocol stack of packets.

2. In the switch as shown in Fig.1, there are two VLANs. Port 2 to Port 8 are configured as VLAN1 and port 9 to port 15 are configured as VLAN2. Hosts attached to different VLANs can not communicate with one another. What will be the solution to enable two hosts in different vlans to send packets to each other? (5 %)

Fig.1




3. When a user (Kevin) types the "**ipconfig**" command to check his networking information, he gets the following information (5%)

   C:\users\kevin> ipconfig

   IPv4 address　　140.112.3.220

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Subnet mask 255.255.248.0

Please answer: how many hosts can this subnet support with the static IP?

4. When a bridge network (L2) contains a loop as shown in Fig. 2, there will be problems of forwarding MAC frames. Please explain the problems in details. Assume the spanning tree protocols are not supported in the switch (10%).

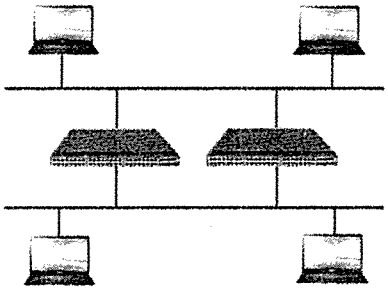

Fig.2: A bridge network contains a loop.

5. In general, a link usually has a large capacity to support more than one transmission. In such a case, Multiple Access Control technologies should be utilized in order to support many transmissions simultaneously. Channelization, random access, and polling-based technologies are three major categories of MAC. Please list **one technique in each category** and explain how it works in details. (10%)

6. (a) Suppose all of the network sources send data at a constant bit rate. Would packet-switching or circuit-switching be more desirable in this case? Why? (8%)
(b) Now suppose that all of the network sources are bursty – that they only occasionally have data to send. Would packet-switching or circuit switching be more desirable in this case? Why? (8%)

7. (a) Some protocols have in-band control messages. What does it mean when we say control messages are "in-band"? Please give a detailed explanation. And also give one example of a protocol that has in-band control messages. (4%)
(b) Some protocols have out-of-band control messages. Please explain what "out-of-band" control messages means. Please give one example of a protocol that has out-of-band control messages. (4%)

8. Consider the wireless topology as shown in Fig. 3, comprised of 4 APs. The transmission range of each AP is shown in the dotted, shaded circle. Assume that

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the transmissions of two nodes will interfere at a location if and only if they transmit at the same time and their transmission areas overlap. Use this figure to explain what the hidden node problem and the exposed node problem are (10 %)

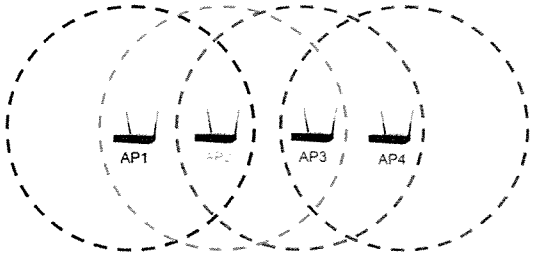


Fig. 3. The transmission range of each AP is shown in the dotted, shaded circle.

9. A routing table is a set of data stored in a router that is composed of lists of routes to particular network destinations. For the reason that the routing policies often separate all possible destination addresses into subsets, where destinations in the same subset are often closely correlated, having similar network addresses and should be routed to the same next hop, the destinations addresses are expressed in CIDR(Classless Inter-Domain Routing) to achieve "address aggregation." With this style of routing table, the router matches a prefix of the destination of a packet with the entries in the table. If there are multiple matches, the router uses the "longest prefix matching rule." That is, it finds the longest matching entry in the table and forwards the packet to the specified interface. The netmasks of the following routing table are expressed both in hexadecimal and binary form. (12%)

| Netmask | Interface |
|---|---|
| BE.A3.0.0/12 | A |
| 10111110.10101011.01010001.00000000/20 | B |
| BE.C3.0.0/12 | C |
| 10111110.11001010.00000000.00000000/14 | D |
| 00.0.0.0/2 | E |
| 01000000.00000000.00000000.00000000/2 | F |
| 80.0.0.0/1 | G |

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Determine the interfaces to which the packets with the following destinations should be routed.

A. BE.AB.22.11
B. BE.AB.5C.AA
C. 10111010.11101110.01111011.11011011
D. 10111110.11000010.01010110.01111000
E. BE.C9.29.39
F. 01101111.00000110.00111100.10000110

10. Assume the following parameters for a packet switching network which a source node sends L message (length in bits) through two routers as shown in Fig. 4. The source node and two routers transmits the packet with data rate B(in bits per second). Assume the propagation delay between each transmission link (source-to-first router, first router-to-second router, second router-to-the destination) is D (delay per hop in seconds). The fixed packet size P with H overhead (header) bits per packet. Assume there are no acknowledgments. Ignore processing delay at the nodes and the waiting delay in each router. For L = 5000 bits, B = 9600, P = 1024, H = 16, S = 0.2, D = 0.001, computer **the end to end latency** (from the first bit sent to last bit received). (10 points)

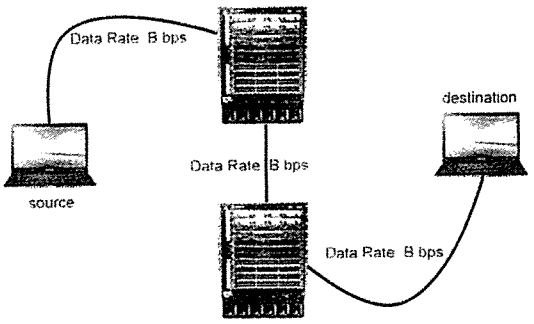


Fig. 4. The topology of a packet switch network.

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