Computer Science Department

2000 Examinations

Z05 Questions

SECTION B

4. The “LAN Emulation” protocol (LANE) is designed to emulate an IEEE 802 LAN on an ATM network.

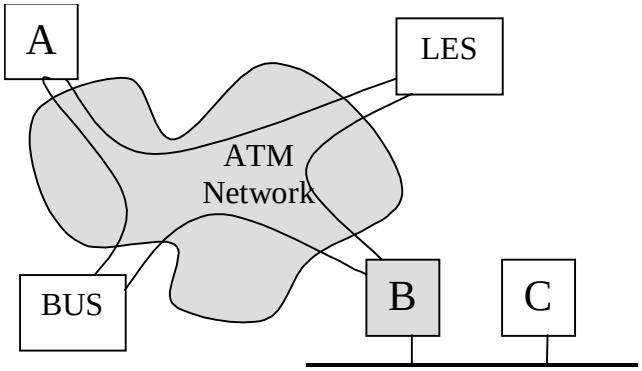
   a) Contrast the principle characteristics of the service provided by an IEEE 802 LAN with that provided by ATM.

   [6 marks]

   b) What is the purpose of address resolution in LANE and how is it achieved?

   [6 marks]

   c) The diagram below shows host *A* and transparent MAC bridge *B* attached to an emulated LAN (ELAN). *B*, together with host *C*, is attached to an Ethernet. *A* and *B* have set up VCCs with the LES and the BUS. *A*, *B* have registered their own addresses with the LES. All ARP caches and *B*’s forwarding table are initially empty.



   Explain the steps which will take place as host *A* sends a MAC frame to host *C* and *C* replies. You should include information about any transactions with the LES and the BUS and about any VCCs that are set up.

   [13 marks]

[TURN OVER]

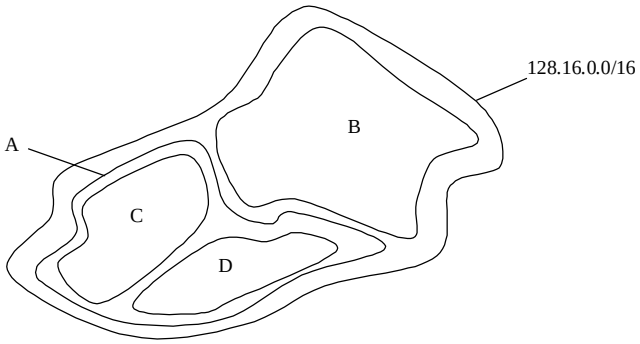
5. a) The IPv4 address space is considered to be too small to accommodate future Internet growth. Explain how the structure of IPv4 addresses has led to the wasting of substantial portions of the IPv4 address space.

[3 marks]

b) In recent years the concept of a “supernet” has been introduced in the Internet. What was the purpose of this introduction and what is its impact on Internet routing? Illustrate, with the aid of an example, how supernet addresses are constructed.

[7 marks]

c) The diagram below represents an IP network with the Class B IPv4 address 128.16.0.0/16. Two IP subnets A and B have been defined inside this network. Further subnets (C and D) have been defined within subnet A.



Suggest circumstances which might lead to the adoption of this configuration. Suggest an allocation of addresses to the subnets giving reasons for your choices.

[9 marks]

d) i) A TCP entity transmits 10,000 bytes of data in 2,000 byte segments (thus, including the TCP header, there will be 2,020 bytes of IP data for each segment). The IP entity is operating with a Maximum Transmission Unit (MTU) of 1024 bytes. Calculate how many packets the IP entity will transmit and justify your answer. (You may ignore errors and assume that IP headers are 20 bytes).

[3 marks]

ii) Calculate the optimal segment size for the TCP entity in part i) given that the objective is to minimise the number of packets sent. How many packets will be sent if this segment size is used?

[3 marks]

6. a) i) The Internet TCP protocol employs a "three-way handshake" when establishing a connection. Explain what is meant by a three-way handshake and why it is necessary to use it.

[8 marks]

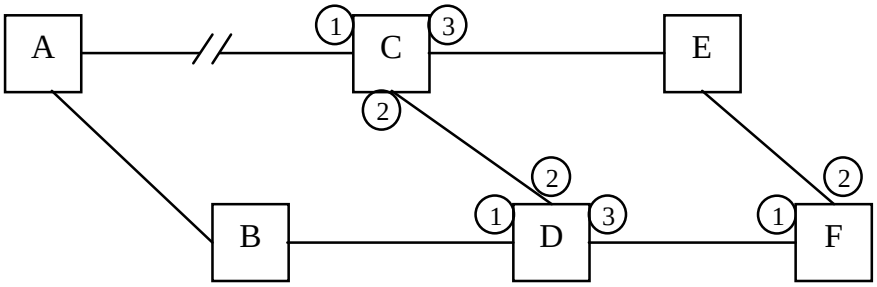
ii) Most TCP implementations employ a mechanism known as "slow start" in the early stages of a connection. Explain what is the purpose of this mechanism and how it operates.

[8 marks]

[Question 6 continued on next page]

[Question 6 continued]

b) The diagram below shows a configuration of Internet routers (*A*-*F*) which achieve dynamic routing through the use of a *Distance Vector* routing algorithm. The metric used is a simple hop-count (if two equal-length routes are available then the one via the lower numbered interface is chosen).



The link between *A* and *C* has been broken for some time and routing has stabilised to accommodate the situation. Each router maintains a routing table like the one below:

Routing table for Router F

Destination	Hop count	Interface	Next router
A	3	1	*D*
B	2	1	*D*
C	2	1	*D*
D	1	1	*D*
E	1	2	*E*
F	0	-	*F*

i) Give the current routing table for router *C*.

[2 marks]

ii) Router *D* now discovers that the link between *B* and *D* has broken. Immediately after this (i.e. before *D* has reported the fact to any other routers), *D* receives distance vectors from *C* and *F* based on their *current* routing tables. Clearly outline the reasoning that *D* would use in calculating its new routing table entry for node *A* following receipt of the distance vectors from *C* and *F*.

[4 marks]

iii) How will *C*'s routing table for node *A* be amended next time it receives a distance vector from *D*? What problem of distance vector algorithms does this illustrate?

[3 marks]

[END OF PAPER]