Question 1.
a) Describe the principle of operation of a token-based ring LAN. How does a destination station indicate whether or not it has correctly received a frame? *[7 marks]*

b) Identify why multiple frames from different sources can be on an FDDI ring at the same time, but not on a token ring at the same time. Compare the provision for robustness in a token ring to those in FDDI. *[18 marks]*

c) What is the minimum size (bit length) of a Token ring? Assuming there are 20 stations attached to a token ring operating at 16Mbps, that each token consists of 24 bits, that the length of the ring is 1000m, that the maximum length of a frame is 4000 bits, calculate the maximum delay that a station might experience on this token ring (N.B. the speed of propagation is 2x108 m/sec) *[8 marks]*

Question 2
a) Explain why multiple stages are often used in space division switching, illustrating your answer by considering the cross-bar switch, and explain what is meant by 'blocking'. How may the probability of blocking in a multi-stage switch be reduced? *[16 marks]*

b) Why is the time slot interchange mechanism required in digital telephone switches, and why is there a delay associated with time slot interchange? Why is a space division switching element also required? *[17 marks]*

Question 3.
a) Describe the operation of a synchronous digital carrier, including in your answer explanations of interleaving, and frame alignment. *[6 marks]*

b) Explain what you think is meant by the word plesiochronous. How might a channel from a carrier high up in the plesiochronous digital hierarchy(PDH) be retrieved? *[11 Marks]*

c) Describe the basic principle behind the synchronous digital hierarchy (SDH or otherwise known as SONET). How might a channel be retrieved from a carrier that is high up in the synchronous digital hierarchy? *[10 marks]*

d) Write one hundred words or less on the differences between SDH and PDH. Which would you chose? *[6 Marks]*

Question 4.
a) Explain the principles behind Carrier Sense Multiple Access with Collision Detection (CSMA/CD). Include in your answer a description of possible CSMA back-off strategies. Why is there a minimum size for an Ethernet frame? Why is there a maximum length for an Ethernet Cable? *[23 marks]*

b) The current move to 10BaseT seems to be a retrograde step. Discuss the naivety of the statement, giving examples where appropriate. *[10 marks]*

Question 5.
a) Describe the transmission impairment particularly associated with digital transmission over twisted pairs, and state how you would provide an improvement. Describe which methods you would consider for full-duplex digital communication over the local loop (as required for Basic Rate ISDN), and identify any associated advantages and disadvantages, which would make you choose one method over others. *[18 marks]*

b) Go-Back-N is used as a suitable data-link protocol for the D-channel in N-ISDN. In some circumstances, the D channel is alos used for data transmission. In a satellite environment, the propagation delay is much larger than experienced on terrestrial links. What change to the data-link protocol operating parameters would you need in order to accomadate this environment? *[15 marks]*

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