Section A

1.

Discuss the characteristics of synchronous, isochronous and asynchronous packet data traffic, and outline their Quality of Service (QoS) requirements.

[5 marks]

Describe the access control employed by the Fibre Distributed Data Interface (FDDI) and the mechanism it uses to support the QoS requirements of both synchronous and asynchronous traffic.

[10 marks]

Describe the access control employed by the Distributed Queue Dual Bus (DQDB) and the mechanism it uses to support the QoS requirements of both synchronous and asynchronous traffic.

[10 marks]

2.

Consider a network with M nodes connected by N links. Each node is assumed to be an independent server with Poisson distributed service rate. The capacity of the i^{th} link is given as C_i. The total traffic (γ) in the network as well as the way it is routed is assumed to be known.

Outline how the use of windowing techniques can affect the performance of a network.

[7 marks]

Derive the optimal window size for the network from the mean network delay $T = \sum_{i=1}^{N} \frac{\lambda_i}{\gamma(uC_i - \lambda_i)}$ where λ_i is the arrival rate at link i and 1/u is the mean message length.

[9 marks]

Explain in detail how the window management operates under IBM's Systems Network Architecture (SNA).

[9 marks]

3.

Consider a store & forward network consisting of M nodes connected by N links. The traffic generated at each node of the network (γ_j) as well as the way it is routed is assumed to be known. The cost of a link is a linear function of its capacity $D_i = \alpha_i + \beta_i C_i$

Determine the link capacities C_i that will minimise the total cost of the network if the mean message delay for the network $T = \sum_{i=1}^{N} \frac{\lambda_i}{\gamma(uC_i - \lambda_i)}$ is constrained not to exceed T_0. Here $\gamma = \sum_{j=1}^{M} \gamma_j$ is the total rate of traffic generated, λ_i is the arrival rate at link i and 1/u is the mean message length.

[16 marks]

Determine the cost of the resulting network?

[7 marks]