

SECTION A

1. C
2. C
3. D
4. A
5. B
6. A
7. D
8. B
9. C
10. C
11. B
12. A
13. C
14. D
15. B
16. C
17. B
18. D
19. A
20. A
21. D
22. D
23. B
24. A
25. D
26. C
27. C
28. D
29. A
30. D

[Award 2 marks for each correct answer, up to 60 marks.]

SECTION B

1. a) Briefly explain the following functions performed by protocols at different levels:

- i) Connection control (2 marks)
- ii) Ordered delivery (2 marks)
- iii) Flow control (2 marks)

Model answer

- i) Determine whether the data transfer is connection [1 mark] or connectionless oriented. [1 mark]
- ii) Ensure that PDUs arrives in the order [1 mark] which they were sent. [1mark]
- iii) Performed by a receiving entity to limit the amount [1 mark] or rate of data that is sent by a transmitting entity. [1 mark]

b) Data transmission events are commonly subjected to various distortions imposed by the transmission system. Describe the likely reasons that cause the following distortions:

- i) Impulse noise (2 marks)
- ii) Inter-modulation noise (2 marks)

(Total: 10 marks)

Model answer

- i) Irregular pulses or noise spikes of short duration [1 mark] and of relatively high amplitude. [1 mark]
- ii) Signals at different frequencies [1 mark] share the same transmission medium. [1 mark]

2. a) Describe how light rays are transmitted over the transmission medium for the *step-index* and *graded-index* multimode propagation techniques for fibre-optics. (6 marks)

Model answer

Step-index

Rays at shallow angles are reflected [1 mark] and propagated along the fiber, [1 mark] other rays are absorbed by the surrounding material. [1 mark]

Graded-index

The higher refractive index at the center [1 mark] makes the light rays moving down the axis advance more slowly [1 mark] than near the cladding [1 mark] Or Rather than zig-zagging off the cladding [1 mark] light in the core curves helically [1 mark] because of the graded index reducing its travel distance. [1 mark]

(4 marks)

- [Accept if answers Not in sequence]**

- b) Describe **three (3)** disadvantages of using *selective-Reject* ARQ compared to go-back-N error control technique. (3 marks)

Model answer

- Receiver must maintain a buffer large enough to save post-SREJ frames.
- Must contain logic for reinserting that frame in the proper sequence.
- The transmitter requires more complex logic to be able to send frame out of sequence.
- The window size limitation is more restrictive than go-back-N.

Note: 1 mark for each correct explanation - 3 answers (Total = 3 marks)

(Total: 10 marks)

- 4.a) Describe briefly **three (3)** advantages of the *datagram switching* technique compared to *virtual circuit*. (3 marks)

Model answer

- Call setup phase s avoided. [1 mark]
- Being more primitive, it is more flexible. [1 mark]
- Delivery of data packets are inherently more reliable. [1 mark]

- b) State **three (3)** performance criteria for routing techniques of packet-switching networks. (3 marks)

Model answer

- Number of hops
- Cost
- Delay
- Throughput

Note: 1 mark for each correct answers - 3 answers (Total = 3 marks)

- c) State the advantages for using *virtual paths* for logical connections in Asynchronous Transfer Mode (ATM) transmissions. (4 marks)

Model answer

- Simplified network architecture [1 mark]
- Increased network performance and reliability [1 mark]
- Reduced processing and short connection setup time [1 mark]
- Enhanced network services [1 mark]

(Total: 10 marks)

5. a) What are the differences between connectionless and connection-oriented routing? (8 marks)

Model answer

Connectionless-oriented

- Connectionless routing means each packet is treated separately and makes its own way through the network. [1 mark]
- It is possible that different packets will take different routes through the network depending upon the type of routing used and the amount of traffic. [1 mark]
- Because packets following different routes may travel at different speeds, they may arrive out of sequence at their destination. The sender's network layer therefore puts a sequence number on each packet, in addition to information about the message stream to which the packet belongs. [1 mark]
- The network layer must reassemble them in the correct order before passing the message to the application layer. [1 mark]

Connection-oriented

- Connection-oriented routing sets up a virtual circuit between the sender and receiver. In this case, a temporary virtual circuit is defined between the sender and receiver. [1 mark]
- The network layer makes one routing decision when the connection is established, and all packets follow the same route. [1 mark]
- All packets in the same message arrive at the destination in the same order in which they were sent. [1 mark]
- In this case, packets only need to contain information about the stream to which it belongs; sequence numbers are not needed, although many connection-oriented protocols include a sequence number to ensure that all packets are actually received. [1 mark]

- b) What is a "virtual circuit"? (2 marks)

Model answer

A virtual circuit is one that appears to the application software to use a point-to-point circuit, even though it actually does not. [2 marks]

(Total: 10 marks)