

Networking Previous Papers

Section A Answer Section A questions in Answer Book A

A1

This question is about the **Transmission Control Protocol/IP protocol architecture** (TCP).

- a) Define the concept of **protocol architecture**, such as TCP/IP, highlighting the following elements:
 - i. What a protocol architecture is?
 - ii. How protocol architectures should work?
 - iii. Name two examples of protocol architecture's in networking.

- b) Given the following protocols, indicate in which layer of the TCP/IP protocol architecture each can be found?
 - i. Ethernet
 - ii. SMTP
 - iii. Optical fibre
 - iv. UDP
 - v. IPv6

- c) Name the Protocol Data Unit (PDU) for each of the layers of the TCP/IP protocol architecture.

- d) Briefly describe the concept and purpose of the encapsulation/de-capsulation process used in the TCP/IP protocol architecture.

A2

This question is about the Transmission Control Protocol (TCP).

- a) Briefly describe the purpose of TCP as well as the layer of the TCP/IP protocol architecture where it is found.
- b) TCP implements a mechanism called the three-way handshake. Indicate the purpose of such mechanism and, using a diagram, give an example on how it works emphasising the values of the TCP flags used as well as the sequence number.
- c) Briefly explain how TCP uses the **window size** and **acknowledgments** to provide flow control.
- d) Describe three applications and application protocols that require the use of TCP.

A3

This question is about digital data communication techniques.

- a) The transmission of a stream of bits can be done in two ways: synchronously or asynchronously. Indicate how each work and which one is more suitable for the transmission of large blocks of bits.
- b) Explain how **error detection** is achieved in digital data communications and describe one of the error-detection techniques used.
- c) Indicate the purpose of the **Hamming distance** and provide an example on how it is used.
- d) Describe the difference between full-duplex and half-duplex communications

Section B
Answer Section B questions in Answer Book B

B4

This question is about Wide Area Networks (WANs).

a) Indicate in which layers of the OSI model do WANs operate and describe two WAN services offered in each of those layers (2 services per layer).

b) The following terms relate to WAN terminology:

- | | |
|---------------------------------------|---|
| (1) Demarcation point | (2) Data Terminal Equipment (DTE) |
| (3) Customer Premises Equipment (CPE) | (4) Data Communications Equipment (DCE) |
| (5) Local loop | (6) Central Office (CO) |

The following are descriptions or definitions of the terms (in a different order)

- (A) Physical network that connects the CPE to the CO.
- (B) Primarily provides an interface to connect subscribers to a communication link in the WAN cloud.
- (C) Local service provider facility or building that connects the CPE to the provider network.
- (D) A customer device that connects to the local loop through the DCE.
- (E) Separates customer equipment from service provider equipment.
- (F) The devices owned or leased by the customer that connects to the carrier.

For each term, write down the description or definition that most closely matches it, e.g. (7) – (G).

c) Explain the main difference between a circuit-switched network and a packet-switched network. Indicate which one would have higher latency and jitter and explain why.

d) Given the following WAN access options indicate which type of network they are classified as (circuit-switched or packet-switched).

- i. ATM
- ii. ISDN
- iii. MPLS
- iv. Frame Relay
- v. PSTN

B5

This question is about the concept of Quality of Service (QoS).

- a) Traffic can be characterised by four elements (1) latency, (2) jitter, (3) loss and, (4) bandwidth. Briefly describe each of those elements.

- b) Given the following traffic characteristics, indicate whether they describe (1) voice, (2) video or (3) data traffic.
 - i. Can be very greedy consuming a large portion of network capacity.
 - ii. Without QoS and a significant amount of extra bandwidth capacity, this traffic typically degrades.
 - iii. Cannot be retransmitted if lost.
 - iv. Must receive a higher UDP priority.
 - v. Requires at least 384 Kbps of bandwidth.
 - vi. Traffic can be predictable and smooth.
 - vii. Does not consume a lot of network resources.
 - viii. Traffic can be smooth or bursty.
 - ix. Traffic can be unpredictable, inconsistent, and bursty.

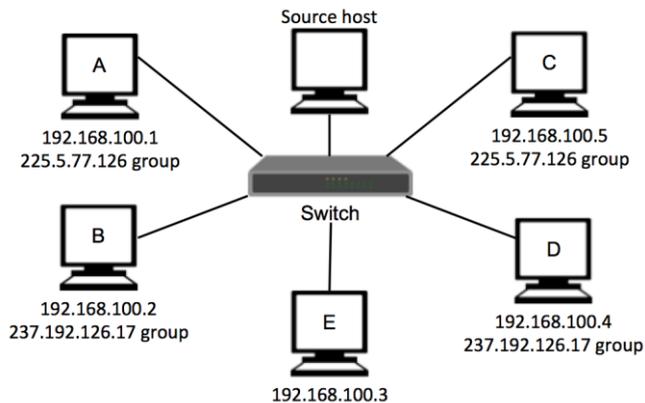
- c) Queuing is congestion management tool used in QoS to buffer and prioritise traffic. Name and describe two queuing algorithms available.

- d) Name and briefly describe two QoS implementations in a network.

B6

This question is about IP addressing.

a) Consider the following diagram and the IPv4 addresses shown.



Identify which devices will receive the packet if the destination IP address and the type of IP address each is (unicast, broadcast or multicast).

- i. 192.168.100.2
- ii. 225.5.77.126
- iii. 192.168.100.255

b) A host was given the IP address 198.168.4.121/27. Consider this address and indicate:

- i. The network address to which the host belongs.
- ii. The network broadcast address to which the host belongs.
- iii. The total number of hosts available in the network.
- iv. Can the following IP address be assigned as the default gateway of the host: 192.168.4.93?

c) Describe the concept of public and private IP addresses and give an example for each of them.

d) In IPv6, indicate the difference between a link-local address and a unique local address. Give an example of a unique local address.