6 (a) Four descriptions and three protocols are shown below.

Draw a line to connect each description to the appropriate protocol.

Description		Protocol used

| email client downloads an email from an email server | | HTTP |

| email is transferred from one email server to another email server | | POP3 |

| email client sends email to email server | | SMTP |

| browser sends a request for a web page to a web server | | |

[4]

(b) Downloading a file can use the client-server model. Alternatively, a file can be downloaded using the BitTorrent protocol.

Name the model used.

....[1]

(c) For the BitTorrent protocol, explain the function of each of the following:

(i) Tracker ....

....

....[2]

(ii) Seed ....

....

....[2]

(iii) Swarm ....

....

....[2]
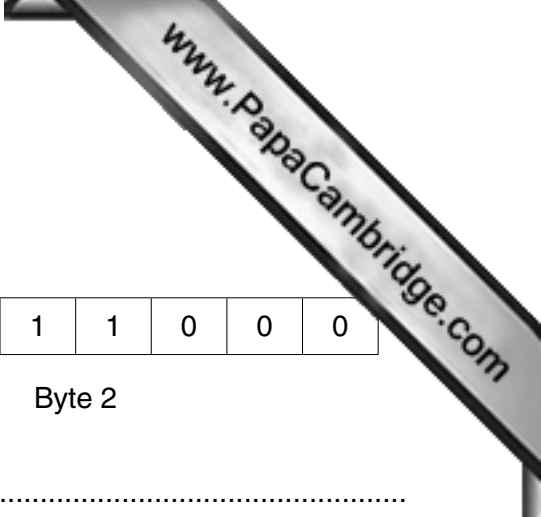
(i) Interpret the data in byte 1 shown below:

7	6	5	4	3	2	1	0
0	0	1	0	0	0	0	1

Byte 1

0	0	0	1	1	0	0	0

Byte 2

....

....

....
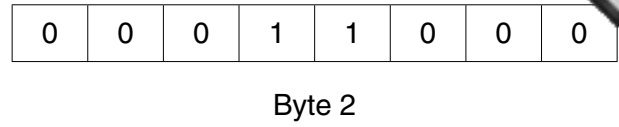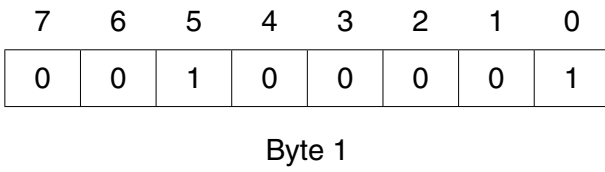
....[2]

(ii) The system receives a temperature reading of –5 degrees from sensor 6.

Complete the boxes below to show the two bytes for this recording. The reading has not yet been processed.

7	6	5	4	3	2	1	0
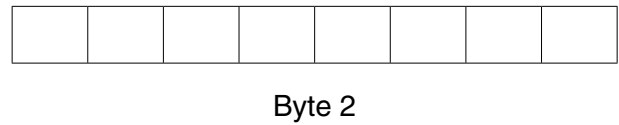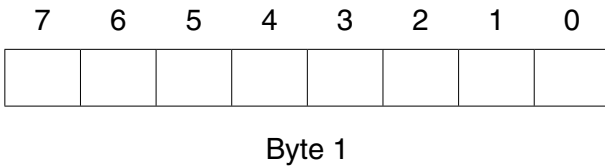
Byte 1

Byte 2

[2]

(d) (i) The accumulator is loaded with the value of byte 1 from location 106.

Write the assembly language instruction to check whether the reading in byte 2 came from location 4.

```
LDD 106           // data loaded from address 106
```

....[4]

(ii) Write the assembly language instruction to set the flag (bit 0) of the byte contained in the accumulator to 1.

....[2]

[Turn over

QUESTION 2.

2 (a) Four descriptions and three types of local area network (LAN) are shown below.

Draw a line to connect each description to the type of LAN it applies to.

Description		Type of LAN
Any packet the listening computer receives may be part of a message for itself		Bus with terminators at each end
Connection provided through an access point		Star
A process for handling collisions has to be implemented		Wireless
Listening computer only receives packets that are addressed to itself		

[4]

(b) A user downloads a file using the FTP protocol.

Explain the function played by each of the following:

(i) Server ....

....

....[2]

(ii) Command ....

....

....[2]

(iii) Anonymous ....

....

....[2]

QUESTION 3.

5 The TCP/IP protocol suite can be viewed as a stack with four layers.

(a) (i) Complete the stack by inserting the names of the three missing layers.
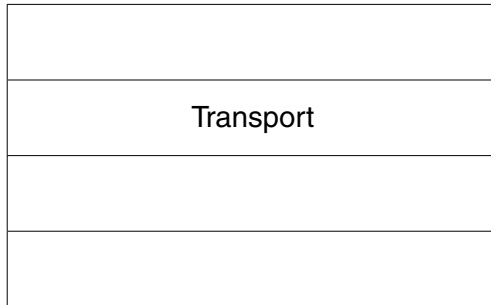
Transport

[3]

(ii) State how each layer of the stack is implemented.

.... [1]

(b) A computer is currently running two processes:

- Process 1 is downloading a web page.
- Process 2 is downloading an email.

(i) Describe **two** tasks that the Transport layer performs to ensure that the incoming data is downloaded correctly.

1 ....

....

....

....

2 ....

....

....

.... [4]

(ii) Name a protocol that will be used by Process 1.

.... [1]

(iii) Name a protocol that will be used by Process 2.

.... [1]

4 Both clients and servers use the Secure Socket Layer (SSL) protocol and its successor, the Transport Layer Security (TLS) protocol.

(a) (i) What is a protocol?

....

....

....

.... [2]

(ii) Name the client application used in this context.

.... [1]

(iii) Name the server used in this context.

.... [1]

(iv) Identify **two** problems that the SSL and TLS protocols can help to overcome.

1 ....

2 .... [2]

(b) Before any application data is transferred between the client and the serv process takes place. Part of this process is to agree the security parameters to

Describe **two** of these security parameters.

1 ....

....

....

....

2 ....

....

....

.... [4]

(c) Name **two** applications of computer systems where it would be appropriate to use the SSL or TLS protocol. These applications should be different from the ones you named in **part (a)(ii)** and **part (a)(iii)**.

1 ....

....

2 ....

.... [2]

5 **(a)** A web browser is used to request and display a page stored on an internet w

Explain how each of the following items is used in this event.

(i) Packet: ....

....

....

....[2]

(ii) Router: ....

....

....

....[2]

(iii) TCP/IP: ....

....

....

....[2]

(b) The Internet can be used for video conferencing. Data can be transmitted over the Internet using either packet switching or circuit switching.

(i) State **two** problems that could arise if video conferencing were to use packet switching.

Problem 1 ....

....

Problem 2 ....

....
[2]

(ii) Explain what is meant by **circuit switching**.

....

....

....

....[2]

(iii) Explain how the use of circuit switching overcomes the problems you h
part (i).

....

....

....

....

....

QUESTION 6.

5 The TCP/IP protocol suite can be viewed as a stack with four layers.

(a) Complete the stack by inserting the names of the three missing layers.

Application layer

[3]

(b) BitTorrent is a protocol used at the Application layer for the exchange of data.

(i) State the network model used with this protocol.

....[1]

(ii) State the use of BitTorrent.

....[1]

(iii) Explain how the exchange of data is achieved using BitTorrent.

....

....

....

....

....

....

....

....[4]

(c) State **two** additional protocols that are also used at the Application layer for data.

For each protocol, give an example of an appropriate exchange of data.

Protocol 1 ....

Example ....

....

Protocol 2 ....

Example ....

....

[4]

5 **(a)** A web browser is used to request and display a page stored on an internet w

Explain how each of the following items is used in this event.

(i) Packet: ....

....

....

....[2]

(ii) Router: ....

....

....

....[2]

(iii) TCP/IP: ....

....

....

....[2]

(b) The Internet can be used for video conferencing. Data can be transmitted over the Internet using either packet switching or circuit switching.

(i) State **two** problems that could arise if video conferencing were to use packet switching.

Problem 1 ....

....

Problem 2 ....

....
[2]

(ii) Explain what is meant by **circuit switching**.

....

....

....

....[2]

(iii) Explain how the use of circuit switching overcomes the problems you h...
part (i).

....

....

....

....

....

QUESTION 8.

4   The Secure Socket Layer (SSL) protocol and its successor, the Transport Layer Security (TLS) protocol, are used in Internet communications between clients and servers.

(a) (i)   Define the term **protocol**.

....

....

....

.... [2]

(ii) Explain the purpose of the TLS protocol.

....

....

....

....

....

.... [3]

(b) A handshake process has to take place before any exchange of data using the TLS protocol. The handshake process establishes details about how the exchange of data will occur. Digital certificates and keys are used.

The handshake process starts with:

- the client sending some communication data to the server
- the client asking the server to identify itself
- the server sending its digital certificate including the public key.

Describe, in outline, the other steps in the handshake process.

....

....

....

....

....

.... [3]

(c) Give **two** applications where it would be appropriate to use the TLS protocol.

1 ....

....

2 ....

....

[2]

3 A local college has CSMA/CD in operation on its Local Area Network (LAN).

(a) One function of CSMA/CD is to monitor traffic on the network.

State **two** other tasks performed by CSMA/CD.

1 ....

2 ....
[2]

(b) The network uses the TCP/IP protocol to transfer files across the network.

(i) State **three** functions of the **TCP** part of this protocol.

1 ....

....

2 ....

....

3 ....

....
[3]

(ii) State **two** functions of the **IP** part of this protocol.

1 ....

2 ....
[2]

(iii) Identify **one** other common protocol that could be used to transfer files across the college network.

....[1]

(c) Protocols are essential for successful transmission of data over a network. The TCP/IP protocol suite operates on many layers.

Give an appropriate protocol for each layer in the table.

Layer	Protocol
Application	
Transport	
Internet	

[3]

(d) The TCP/IP protocol is used to send an email message from one node on a L... a different LAN.

State the steps that take place when the email message is sent and received.

....

....

....

....

....

....

....

....[4]

2 Cables connect the computers in a university admissions department in a sta... server room contains the server and printer for the employees to use. The departm... employees. Each employee has a computer connected to the star network.

(a) (i) Draw a diagram to show this topology.

[3]

(ii) Explain the benefits to the admissions department of using a star topology.

....

....

....

....

....

....

....

....

....

.... [4]

(b) Each department of the university has its own network. All the department r
to the university's main Local Area Network (LAN). The LAN has a bus topology
CSMA/CD protocol.

Describe the CSMA/CD protocol.

....

....

....

....

....

....

.... [3]

(c) Explain how the following devices are used to support the university LAN.

(i) Router ....

....

....

.... [2]

(ii) Network Interface Card (NIC) ....

....

....

.... [2]

(iii) Wireless Access Point ....

....

....

.... [2]

7 **(a)** Identify the **four** layers of the TCP/IP protocol suite.

1 ....

2 ....

3 ....

4 ....
[4]

(b) The TCP/IP protocol suite is responsible for transmitting data across the Internet using packet switching.

(i) Explain why packet switching is used when sending data across the Internet.

....

....

....

.... [2]

(ii) Each packet requires a header.

Describe the purpose of a packet header.

....

....

....

.... [2]

(iii) Identify **three** items that should be contained in a packet header.

Item 1 ....

....

Item 2 ....

....

Item 3 ....

....
[3]

3 A computing department in a school has a Local Area Network (LAN) with a bus ̖

(a) A description of sending a message on a bus network is given.

Complete the following description by inserting an appropriate term in each space.

Computer 1 and Computer 2 are on the same bus network. Computer 1 sends a message to

Computer 2. Before the message is sent, it is split into ....

Computer 1 needs to check that the .... is free, before sending the

message, otherwise a .... will occur that will be managed by the

.... protocol.

[4]

(b) The computing department's LAN needs to connect to the Internet.

Explain how each device is used in the operation of the bus network.

Router ....

....

....

....

Network Interface Card (NIC) ....

....

....

....
[4]

(c) The computing department's network is being adapted to allow students to ⌁
devices.

(i) Identify **two** types of hardware components the computing department will need
wireless connection.

1 ....

2 ....

[2]

(ii) Describe how the wireless connection sends and receives data.

....

....

....

....

....

....

....

.... [4]