# 9.1 Communication

Name: _____

Class: _____

Date: _____

Time: **356 minutes**

Marks: **249 marks**

Comments:

## Q1.

Employees at a bank use client computers to access data that is stored on a database server.

The database server uses software to query and modify data stored in a database on hard disk drives. It returns the results of these queries to the clients over the bank's computer network.

The performance of the system is unsatisfactory: the time-delay between a client sending a query to the server and the client receiving the results is unacceptably long.

Explain how the performance of the system might be improved. You should consider the following factors that might be affecting the performance:

- the hardware of the server
- the design of the computer network
- the database and software running on the server.

In your answer you will be assessed on your ability to follow a line of reasoning to produce a coherent, relevant and structured response.

**(Total 12 marks)**

## Q2.

In a particular communications system, eight different voltage levels are used to encode the value of groups of bits. Each voltage level encodes the value of one group of bits.

(a) Given that eight different voltage levels are used, how many bits can be in a group that is encoded by a voltage level?

_____

_____

**(1)**



(b) The baud rate for this system is 500 baud.

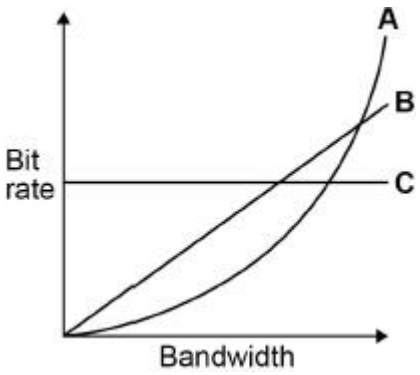
What is the system's bit rate?

_____

_____

**(1)**

The graph below shows three suggested relationships between bandwidth and bit rate.




(c) Shade **one** lozenge to indicate which of the lines, **A**, **B** or **C** in the graph, shows the correct relationship between bandwidth and bit rate.

A ⬭ B ⬭ C ⬭

**(1)**

(d) The system sends the data over a long distance using serial communication.

Explain why serial communication is more appropriate in this instance than parallel communication.

_____

_____

_____

_____

_____

_____

**(2)**



**(Total 5 marks)**

## Q3.

A bar code scanner is connected to a computerised point of sale system (till). When a product is sold, the bar code that is printed on the product is scanned by the scanner and transmitted to the point of sale system.

This transmission uses asynchronous serial communication and odd parity.

**Figure 1** shows the ASCII code for the character "9", which has been read from the bar code, being transmitted to the point of sale system.

(a) Write the missing values of the stop bit, parity bit and start bit on **Figure 1**.

**Figure 1**

| | | 0 | 1 | 1 | 1 | 0 | 0 | 1 | |
|---|---|---|---|---|---|---|---|---|---|
| **Stop Bit** | **Parity Bit** | **ASCII Code** | | | | | | | **Start Bit** |

Direction of data transmission

**(2)**

(b) Explain what asynchronous data transmission is and why stop and start bits are required when asynchronous data transmission is used.

**(3)**

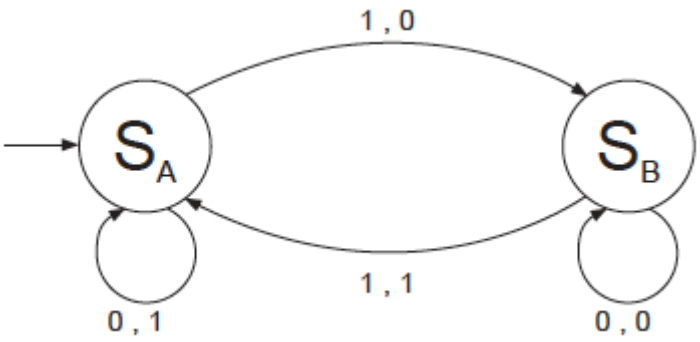
As part of the process of preparing the data for transmission, the 7-bit ASCII code (0111001) is processed by a Mealy machine (a type of Finite State Machine with output).

The ASCII code is processed from left to right, i.e. the leftmost 0 is the first digit to be processed.



**Figure 2** shows a diagram of the Mealy machine. Each transition is labelled with the input symbol that will trigger the transition, followed by a comma, followed by the output that will be produced.

**Figure 2**




(c) What output is generated by the Mealy machine in **Figure 2** for the input `0111001`?

**(1)**

(d) The last digit output by the Mealy machine is used in the transmission.

Explain what this last digit represents.

_____

_____

**(1)**

(e) Serial communication has been chosen instead of parallel communication even though the scanner and point of sale system are located next to each other.

State **two** reasons why this choice is appropriate.

Reason 1 _____

_____

_____

Reason 2 _____

_____

_____

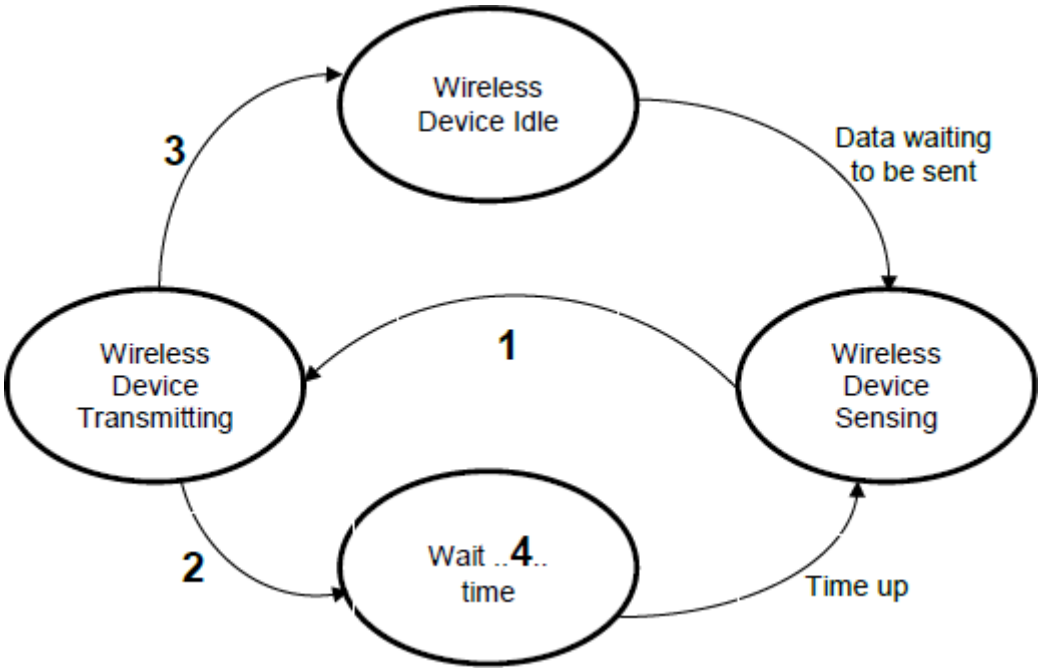
**(2)**

**(Total 9 marks)**

## Q4.

Wireless networks make use of the carrier sense multiple access and collision avoidance (CSMA / CA) method when accessing a wireless network to transmit data.

The diagram below shows a simplified state transition diagram of the CSMA / CA wireless network access method without use of request to send / clear to send (RTS / CTS).




(a) Complete the table by writing in the descriptions that should appear at positions **1** to **4** in the above diagram.

| Label | Description |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

**(4)**



(b) Explain the role of a service set identifier (SSID) in wireless networking and why some network administrators turn off SSID broadcasting.

_____

_____

_____

_____

_____

_____

**(3)**

(c) Explain why browsing the Internet might be slower at a public hotspot in a coffee shop than at home on a wireless network.

_____

_____

_____

_____

**(2)**

**(Total 9 marks)**

## Q5.

The internal buses in a computer use parallel communication while most peripherals communicate with a computer using serial communication.

(a) Explain the differences between the ways in which parallel and serial communications carried out.

_____

_____

_____

_____

**(2)**

(b) Most peripherals, such as printers and keyboards, communicate with a computer using a serial connection.

Apart from the widespread availability of USB (Universal Serial Bus) ports, explain why peripherals usually use a serial communication method such as USB instead of parallel communication.

_____

_____

**(1)**



(c) In communications systems, a distinction is made between the bit rate and the baud rate.

Define the term baud rate.

_____

_____

**(1)**

(d) Explain how it is possible for the bit rate to be higher than the baud rate.

_____

_____

**(1)**

**(Total 5 marks)**

## Q6.

Two computers, **A** and **B**, are involved in a secure communication that uses asymmetric encryption. **A** is sending a message to **B**.

Each computer has a public key and a private key.

(a) Complete the missing words in the following paragraph.

**A** will encrypt the message using _____key. The message

will be decrypted by **B** using _____key.

**(2)**

(b) The security of the communication could be improved by the addition of a digital signature.

State **two** benefits of including a digital signature.

_____

_____

_____

_____

**(2)**

**(Total 4 marks)**

## Q7.

The table below lists three situations which involve the transmission of data / information / addresses.

(a) For each row in the table below, place a tick in **one** column to indicate whether the transmission is most likely to be serial, most likely to be parallel or could be either serial or parallel.

| Situation | Most likely to be Parallel | Most likely to be Serial | Could be either Serial or Parallel |
|---|---|---|---|
| Sending data to a peripheral, such as a printer, that is plugged directly into a computer. | | | |
| Transferring memory addresses between the processor and the main memory of a desktop computer. | | | |
| Transmitting an email across a WAN from a computer in England to | | | |

| | | | |
|---|---|---|---|
| an email server in Scotland. | | | |

**(3)**

(b) Data communication often uses a handshaking protocol.

Explain **one** purpose of a handshaking protocol.

_____

_____

**(1)**

(c) When data is transmitted over long distances, eg via satellites, latency can become a problem.

Explain what latency is.

_____

_____

**(1)**

**(Total 5 marks)**

## Q8.

Data is being transmitted along a serial link using asynchronous data transmission and odd parity.

(a) Explain what *serial data transmission* is and how it differs from *parallel data transmission*.

_____

_____

_____

**(2)**

(b) **Figure 1** shows a byte of data being transmitted along the serial link using odd parity.

Write the missing values of the **Stop bit**, **Parity bit** and **Start bit** on **Figure 1**.

**Figure 1**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | |
| **Stop bit** | **Parity bit** | **Byte of data** | | | | | | | | **Start bit** |

Direction of data transmission

**(2)**

(c) Explain what *asynchronous data transmission* is.

_____

_____

_____

_____

**(1)**

**(Total 5 marks)**

## Q9.

(a) Explain the differences between the World Wide Web and the Internet.

_____

_____

_____

_____

_____

_____

_____

_____

_____

**(4)**



(b) Major parts of the Internet run on a packet switched network.

What is meant by the term *packet switching*?

_____

_____

_____

_____

**(2)**

(c) A packet being sent across the Internet may contain the details of a socket, for example 12.23.45.89:80.

Complete the table below to explain what each part of the socket in the table represents.

| Part | Represents |
|---|---|
| 12.23.45.89 | |
| 80 | |

**(2)**

**(Total 8 marks)**

## Q10.

An ICT technician at a secondary school has access to a variety of programs that she uses to manage a group of servers.

(a) State **one** use for each of the protocols listed below.

(i) Telnet: _____

**(1)**

(ii) FTP: _____

**(1)**

(iii) POP3:_____

**(1)**

(b) Whilst remotely connecting to one of the servers the technician executes a command that displays the current network connections. The table below shows these network connections.

| Active Internet Connections | | | | | |
|---|---|---|---|---|---|
| Proto | Recv-Q | Send-Q | Local Address | Foreign Address | (state) |
| tcp4 | 0 | 0 | 192.168.3.205:80 | 74.125.4.148:58539 | ESTABLISHED |
| tcp4 | 0 | 0 | 192.168.3.205:80 | 208.43.202.29:57458 | ESTABLISHED |
| tcp4 | 37 | 0 | 192.168.3.205:25 | 208.43.202.29:57459 | CLOSE_WAIT |



From the table above provide an example of the following:

(i) IP address: _____

**(1)**

(ii) Port::

_____

**(1)**

(iii) Socket: _____

**(1)**

(c) State **two** reasons why the technician uses remote management software from her computer rather than going to the actual servers.

Reason 1: _____

_____

Reason 2: _____

_____

**(2)**

**(Total 8 marks)**

## Q11.

A particular long-distance data transmission system transmits data signals as electrical voltages using copper wire.

(a) What is the relationship between the bandwidth of the copper wire and the bit rate at which the data can be transmitted?

_____

_____

_____

**(1)**

(b) The system is affected by latency.

What is *latency* in the context of data communications?

_____

_____

**(1)**

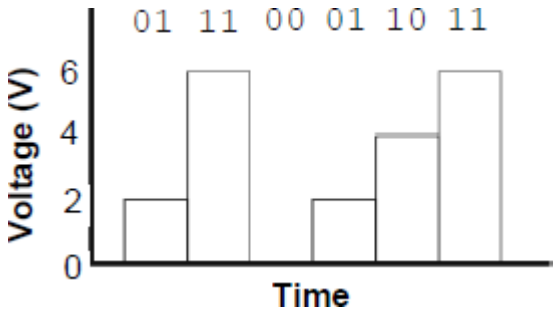
The system uses four different voltage levels so that two data bits can be transmitted with each signal change.



The table below shows the signal levels (in volts) that the system uses for particular binary patterns.

| Binary pattern | Signal level (volts) |
|---|---|
| **00** | **0** |
| **01** | **2** |
| **10** | **4** |
| **11** | **6** |

Using this system, the binary pattern 011100011011 would be transmitted as the voltage sequence 2,6,0,2,4,6 as shown in the graph below:




(c) What, **precisely**, is the relationship between the bit rate and the baud rate for this system?

_____

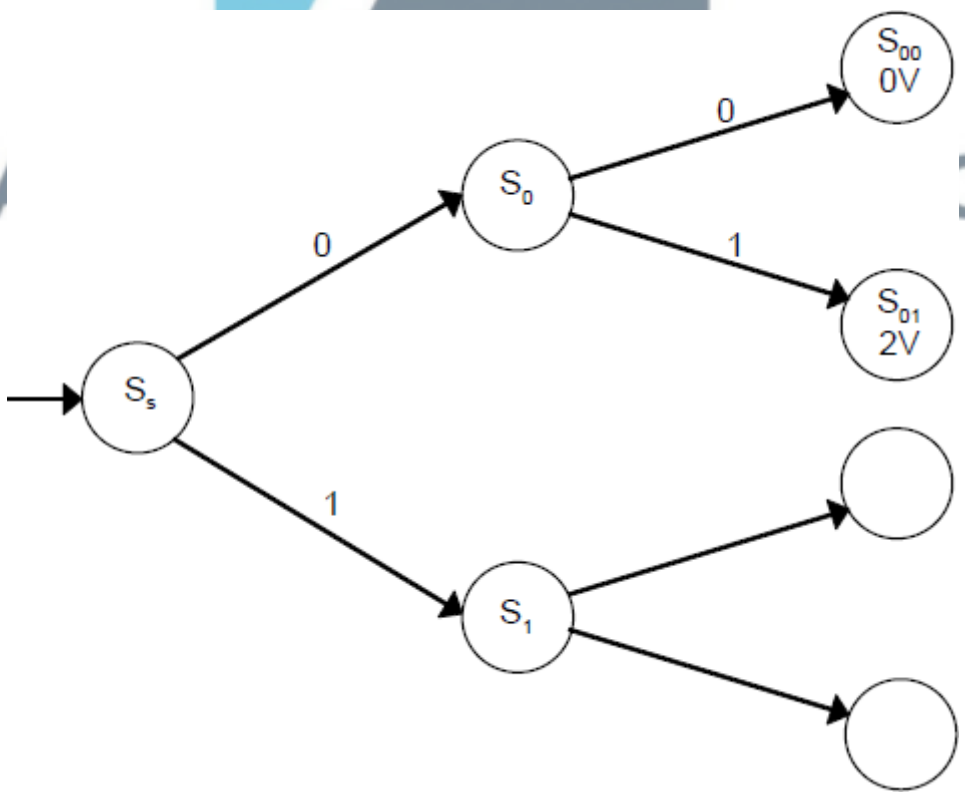
_____

**(1)**

(d) A Moore machine is a type of finite state machine that produces output. The transitions are labelled with the inputs and each state is labelled with a name and the output that it produces; if a particular state has no output then it is labelled with just a name.

The diagram below shows an incomplete diagram of a Moore machine that will convert a two-bit binary code into the signal level (in volts) that is transmitted to represent it, as listed in the table above.

Complete the diagram below. Label all of the transitions and the states that are currently unlabelled. The machine should work for the four binary patterns 00, 01, 10 and 11.




**(4)**

**(Total 7 marks)**

## Q12.

An object-oriented program is being written to store details of the hardware devices that are connected to a computer network in a college. This will be used by the network manager to perform an audit of the equipment that the college owns.

Two different types of devices are connected to the network. They are printers and computers. The computers are categorised as being laptops, desktops or servers.

A class **Device** has been created and two subclasses, **Printer** and **Computer** are to be developed. The **Computer** class will have three subclasses: **Laptop**, **Desktop** and **Server**.

(a) Draw an inheritance diagram for the six classes.

**(3)**

(b) The **Device** class has data fields **MACAddress**, **DeviceName** and **Location**.

The class definition for **Device** is:

```
Device = Class
            Public
              Procedure AddDevice
              Function GetMACAddress
              Function GetDeviceName
              Function GetLocation
            Private
              MACAddress: String
              DeviceName: String
              Location: String
            End
```



The **Computer** class has the following additional data fields:

- **ProcessorName**: Stores the name of the company that manufactured the processor.
- **RAMCapacity**: Stores the capacity of the RAM installed in the computer, in gigabytes.
- **HDDCapacity**: Stores the capacity of the Hard Disk Drive installed in the computer, in gigabytes.

Write the class definition for **Computer**.

_____

**(4)**

(c) The **Laptop** class has the additional data field **BluetoothInstalled**. This field will indicate whether or not the laptop is fitted with a Bluetooth module.

Write the class definition for **Laptop**.



**(2)**

(d) Explain what Bluetooth is and give an example of a task for which a laptop user might use Bluetooth.

What Bluetooth is:

**(2)**

Example use:

_____

_____

**(1)**

**(Total 12 marks)**

## Q13.

A home desktop computer is connected to a number of peripherals including a printer and a keyboard. It is also connected to the Internet and to a wired Local Area Network (LAN).

(a) The keyboard is connected to the computer using a serial connection at a speed of 9,600 bits per second with a baud rate of 9,600 baud.

Explain what is meant by *baud rate.*

_____

_____

**(1)**

(b) A printer is connected to the same computer using a faster serial connection at a speed of 128,000 bits per second and a baud rate of 64,000 baud.

(i) Explain how it is possible for the number of bits transmitted per second to be higher than the baud rate.

_____

_____

**(1)**

(ii) When the computer has a document to print, the computer and printer must perform a handshake. The table below shows the steps involved in a handshake to send a single character along the serial link to the printer.

Write labels for the missing steps in the **Data / Request Sent** column of the table below, assuming that the printer is able to accept the character.

| Step | Direction | Data / Request Sent |
|---|---|---|
| 1 | Computer ⟶ Printer | Is printer ready to receive data? |
| 2 | Computer ⟵ Printer | |
| 3 | Computer ⟶ Printer | |
| 4 | Computer ⟵ Printer | Printer receiving data |
| 5 | Computer ⟶ Printer | Sending has ended |
| 6 | Computer ⟵ Printer | |

**(3)**

(c) The computer is connected to a small LAN using a wired baseband connection and to the Internet using a broadband connection.

Explain the difference between baseband and broadband connections and justify why the LAN connection is baseband whereas the Internet connection is broadband.

In your answer you will also be assessed on your ability to use good English, and to organise your answer clearly and coherently in complete sentences, using specialist vocabulary where appropriate.

**(4)**



**(Total 9 marks)**

## Q14.

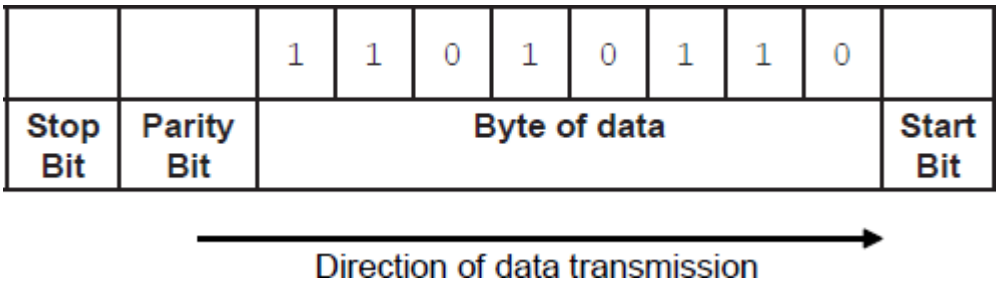
Data can be transmitted using either serial or parallel data transmission.

(a) State **one** advantage of serial data transmission over parallel data transmission.

**(1)**

(b) The diagram below shows a byte of data being transmitted using asynchronous serial data transmission and even parity.

Write the missing values of the stop bit, parity bit and start bit on the diagram below.




**(2)**

(c) Explain what *asynchronous data transmission* is and why start and stop bits are required when it is used.

_____

_____

_____

_____

_____

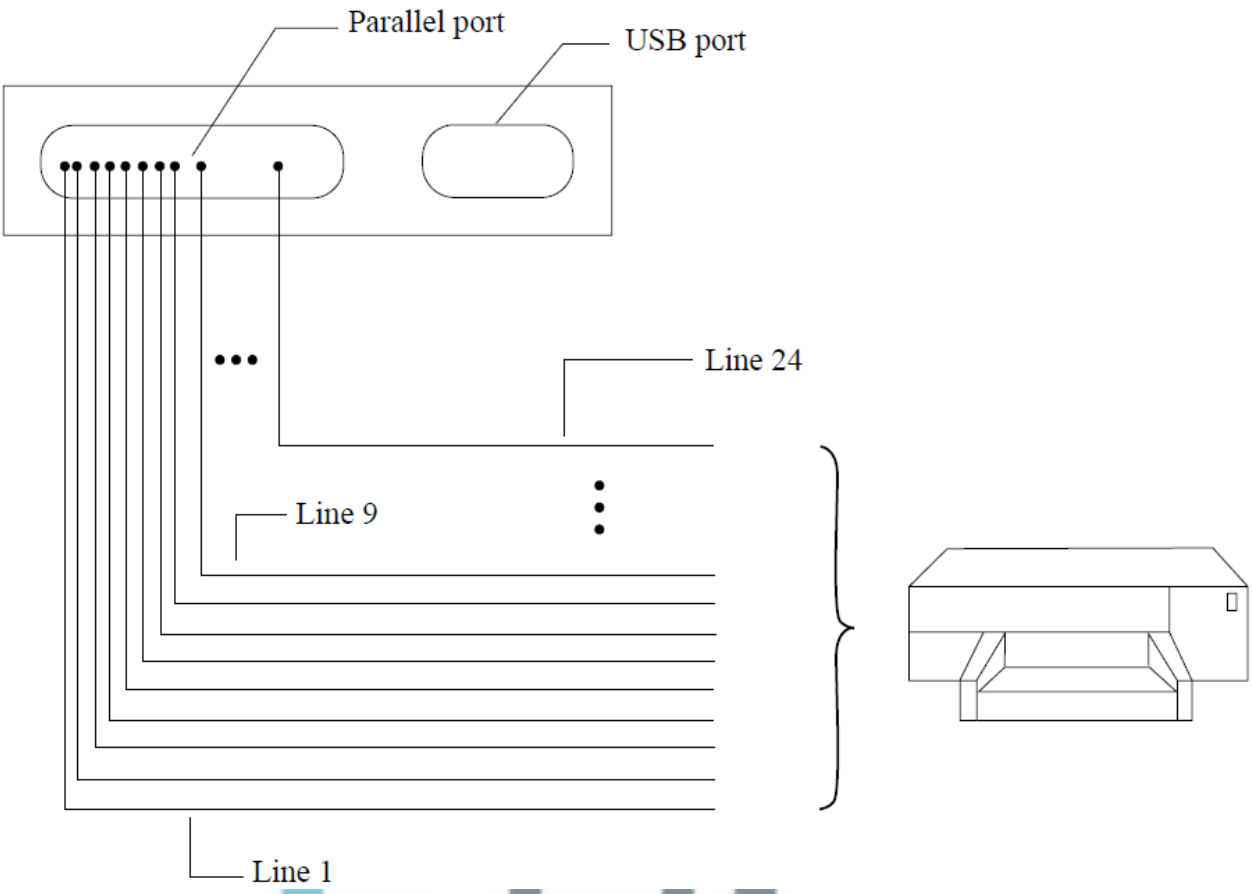
**(3)**

**(Total 6 marks)**

## Q15.

**Figure 1** shows two of the ports on the back of a student's home computer. The parallel port is connected to a laser printer.

**Figure 1**




The parallel port has 24 lines.

- Lines 1 to 7 are used for transfer of the data bits, with the byte's most significant bit transferred on line 1.
- Line 8 is used to transfer the parity bit when used.

(a) Give **one** use for any of the other lines (9 to 24) for the parallel port connection.

_____

**(1)**

(b) (i) Use the ASCII code table shown in the table below to write the **7-bit ASCII binary** code for character 'j'.

_____

ASCII Code Table (part only)

| Character | Decimal | Character | Decimal | Character | Decimal | Character | Decimal |
|---|---|---|---|---|---|---|---|
| <Space> | 32 | 9 | 57 | j | 106 | t | 116 |
| 0 | 48 | a | 97 | k | 107 | u | 117 |
| 1 | 49 | b | 98 | l | 108 | v | 118 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | 50 | c | 99 | m | 109 | w | 119 |
| 3 | 51 | d | 100 | n | 110 | x | 120 |
| 4 | 52 | e | 101 | o | 111 | y | 121 |
| 5 | 53 | f | 102 | p | 112 | z | 122 |
| 6 | 54 | g | 103 | q | 113 | ( | 40 |
| 7 | 55 | h | 104 | r | 114 | ) | 41 |
| 8 | 56 | i | 105 | s | 115 | : | 58 |

**(1)**

(ii) Characters are transmitted as an 8-bit code which includes a **parity bit** (in the most significant bit position of the byte) using **even parity**.

Give the 8-bit binary code for the character 'j'.

_____

**(1)**

(iii) The character 'j' is sent to the laser printer.

Write on **Figure 1** the pattern of bits when this character is transmitted using even parity.

**(3)**

(c) The parallel port uses a protocol called handshaking for the transfer of data.

(i) What is meant by the term *protocol*?

_____

_____

**(1)**

(ii) What is meant by the term *handshaking*?

_____

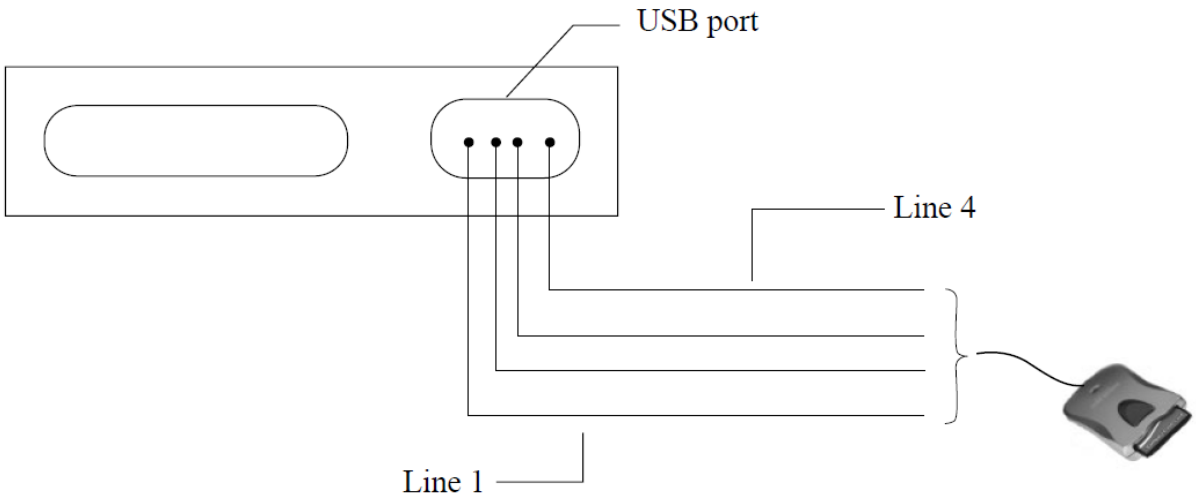
_____

_____

**(2)**

(d) The USB port is connected to a card reader for a flash memory card which the student regularly uses to transfer files from the school's computer system to the student's home computer.

**Figure 2**




The **USBconnection** uses 4 lines (wires).

- Line 1 is used to transfer data from the card reader to the home computer.
- Line 2 is used to transfer data from the home computer to the card reader.
- The most significant data bit is always transferred first.

(i) What does USB stand for? _____

**(1)**

(ii) The USB port is currently in use transferring a spreadsheet file from the memory card to the PC.

Write on **Figure 2** the pattern of bits showing the transfer of the character 'j'.

**(2)**

(iii) Define the term bit rate.

_____

_____

**(1)**

**(Total 13 marks)**



## Q16.

The figure below shows the address bar of a web browser.

(a) This is used to access various websites.


(i) What does 212.219.90.65 represent?

_____

**(1)**

(ii) Another way to access a website is to key a **URL** into the address bar.

What does URL stand for?

_____

**(1)**

(b) Name and describe **two** features you would expect to find on the browser's menu or toolbar which are specific to browser software.

1. _____

Description: _____

2. _____

Description: _____

**(2)**

(c) AQA Wanderers are a local soccer club which has a website. The club's players and members frequently access this website using the URL:

http://www.footyhosting.co.uk/aqawanderers/home.asp

The club pay an annual subscription to the company Footy Hosting Ltd to host the club's site. The company also hosts the sites for hundreds of other soccer clubs.

(i) What is the **domain name** of the website being accessed?

_____

**(1)**

(ii) Explain from the URL shown, how the company may have organised the storage of the pages for all the clubs it manages on its web server.

_____

**(1)**



(d) The soccer club's own computer is used to manage and upload the page content for AQA Wanderers and is done using a broadband connection.

Select from the list below **the most probable value** for the **transfer rate** of the data using the broadband connection. Put a circle around your answer.

20 MB 1.6 GHz 200 bps (bits/sec) 2 Mbps 128 Kbps

**(1)**

(e) The website for a single soccer club takes up approximately 5GB of storage space.

Footy Hosting Ltd currently has 500 clubs as customers and hopes to double this by the end of 2009.

(i) What type of secondary storage is used for a web server?

_____

**(1)**

(ii) Select from the list below **one** value for the minimum size of web server required to host the sites for all clubs (including the proposed expansion in business). Put a circle around your answer.

50 MB  500 MB  20 GB  100 GB  8000 GB

**(1)**

**(Total 9 marks)**

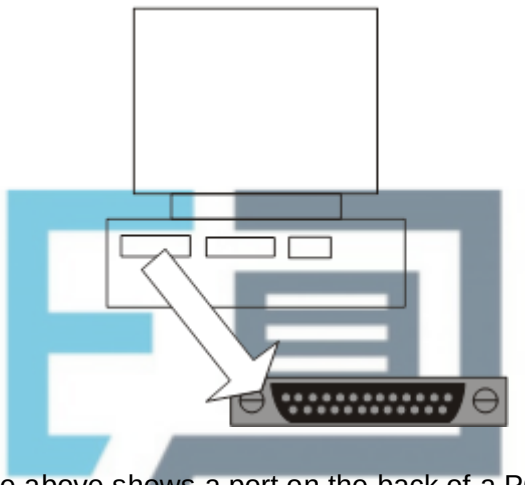
## Q17.

(a) State what is meant by **serial transmission** of data.

_____

_____

**(1)**



(b) (i) The figure above shows a port on the back of a PC which is used for the **parallel transmission** of data; typically between the PC and a printer.

More than eight of the port lines are used during a data transfer.

State **two different** uses for the lines.

1. _____

2. _____

**(2)**



(ii) When would it be **inappropriate** to use parallel data transmission, even when the communicating device has a parallel port?

_____

_____

**(1)**

(c) Define **asynchronous data transmission**.

_____

_____

**(1)**

**(Total 5 marks)**

## Q18.

**Figure 1** below shows an area of main memory storing a text file which is about to be sent to a printer.

| Address | Contents |
|---|---|
| 0 | |
| 1 | |
| ... | |
| ... | |
| 150 | 0100 0101 |
| 151 | 0101 1000 |
| 152 | 0100 0001 |
| 153 | 0100 1101 |

**Table 1**

ASCII Code Table

| Character | Decimal | Character | Decimal | Character | Decimal |
|---|---|---|---|---|---|
| <Space> | 32 | I | 73 | R | 82 |
| A | 65 | J | 74 | S | 83 |
| B | 66 | K | 75 | T | 84 |
| C | 67 | L | 76 | U | 85 |
| D | 68 | M | 77 | V | 86 |
| E | 69 | N | 78 | W | 87 |
| F | 70 | O | 79 | X | 88 |
| G | 71 | P | 80 | Y | 89 |
| H | 72 | Q | 81 | Z | 90 |



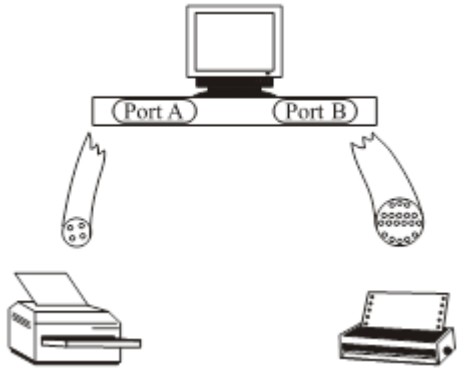
(a) Assuming the first character to be printed is held at address 150, show the **first four** characters to be printed on the page. Use **Table 1.**

_____

**(3)**

(b) **Figure 2** shows there are two printers available on the PC and they are connected to the computer. One is connected to port A, the other to port B.

**Figure 2**




The cable which connects to port A has 4 wires and connects to a USB printer.

The cable which connects to port B has 25 wires of which eight are used for sending data bits.

(i) What does USB stand for?

_____

**(1)**

(ii) What type of data transmission occurs using Port B?

_____

**(1)**

(iii) The computer communicates with the printer connected to port B using a **handshaking protocol.** Explain this term.

_____

_____

_____

_____

**(2)**

(iv) The port B cable uses 8 wires for data bits. Using a handshaking protocol, the other wires are used to send various signals. Name **one** signal.

_____

**(1)**

(v) **Figure 1** shows the first four bytes of the text file to be printed. Name **two** necessary items of software resident in main memory at the time the printout is produced.

1. _____

2. _____

**(2)**

**(Total 10 marks)**

## Q19.

A company sets up a server-based network with ten terminals. Each terminal is a PC with its own secondary storage.

(a) The network was recently created from an existing set of stand-alone computers, and is used by a team of programmers. Describe **two** advantages that networking the computers has brought to the programming team.

1. _____

_____

2. _____

_____

**(2)**

(b) The network manager has the choice of:

Option 1: Installing all the applications software on the server.

Option 2: Installing the applications software on the hard drive of each PC.

(i) Describe **one** advantage to the network manager of Option 1.

_____

_____

**(1)**

(ii) Describe **one** advantage to a terminal user of Option 2.

_____

_____

**(1)**



(c) Each terminal communicates with a printer using a *handshaking protocol.*

(i) Explain the term protocol.

_____

_____

**(1)**

(ii) Explain the term handshaking.

_____

_____

**(2)**

(d) Clients who use the company's website input

http://www.smk-solutions.co.uk/index.htm

into the address bar of their browser.

What is the domain name for the company?

_____

_____

**(1)**

**(Total 8 marks)**

## Q20.

A home computer is used to transfer picture files from a camera-phone to the hard disk of a computer using communications software and a Universal Serial Bus (USB) cable.

(a) What is meant by serial data communication?

_____

_____

**(1)**

(b) The picture files on the camera are each 768 by 1024 pixels. The pictures are encoded as 256-colour images.

(i) How many bytes are needed to store one pixel?

_____

**(1)**

(ii) How many kilobytes are needed to store five pictures?

_____

**(1)**



(c) The camera-phone also plays MP3 sound files. These sound files are produced from music CDs using software on the user's PC. The software has the option to encode the MP3 files at either 64kbps or 128kbps. The MP3 files are then uploaded from the PC to a memory card in the camera-phone.

Give **one** advantage and **one** disadvantage to the user of producing the files at the higher bit rate.

Advantage

_____

_____

Disadvantage

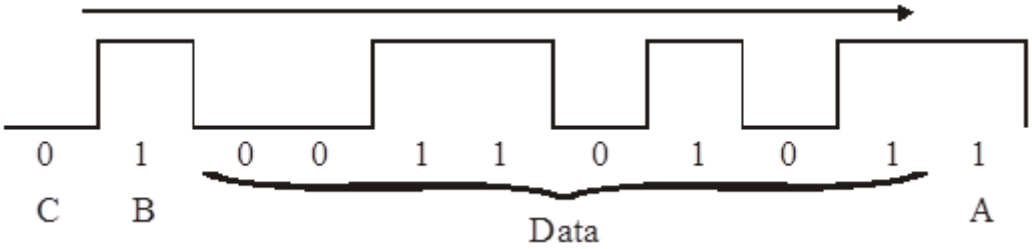
_____

_____

**(2)**

**(Total 5 marks)**

**Q21.**




(a) The figure above represents asynchronous data being transmitted using odd parity in the direction of the arrow. Give the name and the purpose of each of the following bits.

(i) bit A

Name _____

Purpose_____

_____

**(2)**

(ii) bit B

Name _____

Purpose_____

_____

**(2)**



(iii) bit C

Name _____

Purpose_____

_____

**(2)**

(b) What is meant by:

(i) baud rate;_____

_____

**(1)**

(ii) bit rate; _____

_____

**(1)**

(iii) bandwidth? _____

_____

**(1)**

(c) The baud rate and the bit rate of a communication channel may be different.

Explain how this can occur.

_____

_____

_____

_____

**(2)**

**(Total 11 marks)**

## Q22.

(a) Data can be transmitted using parallel or serial transmission. Give **two** reasons why data is normally transmitted over long distances using serial transmission.

1. _____

_____

2. _____

_____

**(2)**

(b) In the context of serial data transmission describe what is meant by



(i) Baud Rate;

_____

_____

**(1)**

(ii) Bit Rate;

_____

_____

**(1)**

(iii) Bandwidth?

_____

_____

**(1)**

(c) What is the relationship between bit rate and bandwidth?

_____

_____

**(1)**

**(Total 6 marks)**

## Q23.

(a) In the context of networks, give the full name of each of the following:

(i) LAN;

_____

**(1)**

(ii) WAN.

_____

**(1)**

(b) Give an example of the use of a:

(i) LAN;

_____

**(1)**

(ii) WAN.

_____

**(1)**

(c) What is meant by **each** of the following terms?

(i) protocol;

_____

_____

**(1)**

(ii) BAUD rate;

_____

_____

**(1)**

(iii) bit rate;

_____

_____

**(1)**

(iv) Bandwidth.

_____

_____

**(1)**

(d) What is the relationship between bandwidth and bit rate?

_____

_____

**(1)**

(e) (i) Define serial transmission.

_____

_____

**(1)**

(ii) Define parallel transmission.

_____

_____

**(1)**

(iii) Give **one** advantage of serial transmission over parallel transmission.

_____

_____

**(1)**

(iv) Give **one** advantage of parallel transmission over serial transmission.



_____

_____

**(1)**

**(Total 13 marks)**

## Q24.

(a) Two of the components of a computer system are a processor and main memory which are connected together by three buses. Name **each** of these buses and explain their purpose.

1. Name _____

Purpose _____

_____

2. Name _____

Purpose _____

_____

3. Name _____

Purpose _____

_____

**(6)**

(b) In order to connect the computer system to a local area network (LAN) an additional piece of hardware is required. Name this piece of hardware and explain its purpose.

Name _____

Purpose _____

_____

**(2)**

(c) A printer is connected to the computer system using parallel transmission. Give **one** reason why parallel transmission may be more appropriate than serial transmission.

_____

_____

**(1)**

(d) Give **one** reason why serial transmission is more appropriate for the local area network.

_____

_____

**(1)**

**(Total 10 marks)**



**Q25.**

(a) The Internet is an example of a Wide Area Network (WAN). Describe a WAN.

_____

_____

**(2)**

(b) (i) What hardware is required to connect a stand-alone computer system to the Internet?

_____

**(1)**

(ii) What type of application software is required to access a web site?

_____

**(1)**

(c) Communication on the Internet is through *serial data transmission*.

What is meant by serial data transmission?

_____

_____

**(1)**

(d) *Baud rate* and *bit rate* are often confused. What is meant by:

(i) baud rate?_____

_____

(ii) bit rate?_____

_____

**(2)**

**(Total 7 marks)**

## Q26.

Acme Design, a small graphic design firm, has several stand-alone computers which staff use for their design work. They would like to use a LAN (Local Area Network) to share printers, scanners and plotters.

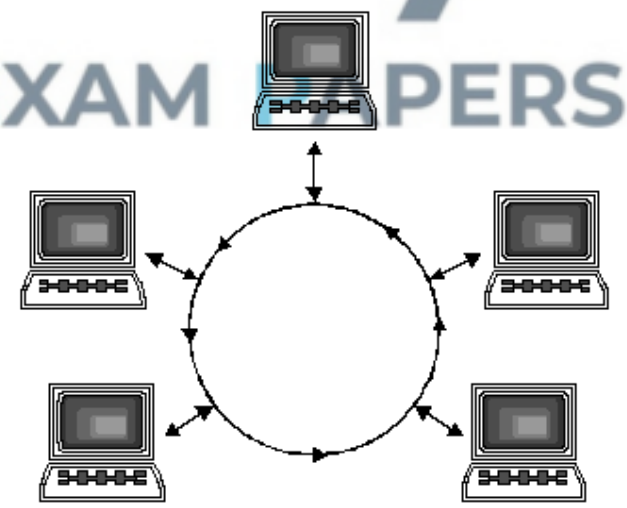
(a) What extra hardware is needed for each stand-alone computer to be connected to a LAN via cables?

_____

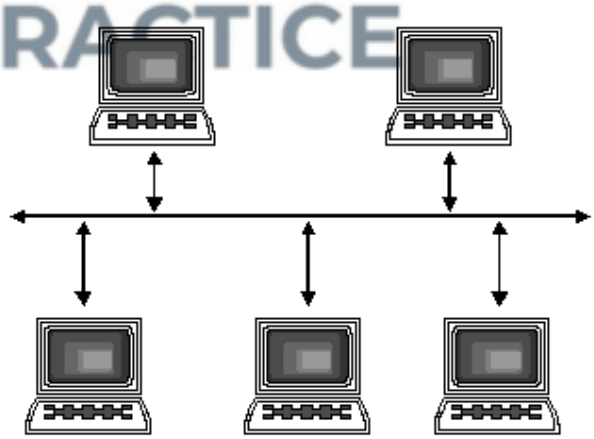
**(1)**

(b) Computers could be connected in one of the topologies shown below.





Topology A



Topology B

(i) Name these network topologies.

A _____ B _____

**(2)**

(ii) Give **one** advantage of topology A over topology B.

_____

_____

**(1)**

(iii) Give **one** advantage of topology B over topology A.

_____

_____

**(1)**

(c) (i) What is a protocol?

_____

_____

**(1)**

(ii) Why is a protocol needed?

_____

_____

_____

**(1)**

**(Total 7 marks)**



## Q27.

One method of sending data to a printer is by using *parallel transmission*.

(a) What is meant by parallel data transmission?

_____

_____

**(1)**

(b) Parallel transmission should **not** be used over long distances.

(i) Why not?

_____

_____

**(1)**

(ii) How should data be transmitted over long distances?

_____

_____

**(1)**

**(Total 3 marks)**

## Q28.

(a) The ASCII coding system uses 7 bits to code a character. The eighth bit is used as a parity bit. Explain how a parity bit is used when transmitting ASCII codes using even parity.

_____

_____

_____

_____

**(3)**

(b) What is the relationship between bit rate and bandwidth?

_____

_____

**(1)**

**(Total 4 marks)**

## Q29.

(a) Explain the modes of network operation:

(i) Baseband _____

_____

_____

_____

**(2)**

(ii) Broadband _____

_____

_____

_____

**(2)**

(b) Bus local area networks such as Ethernet operate in baseband mode. Wide area networks operate in broadband mode.

(i) Give **two** reasons why wide area networks are operated in broadband mode.

1. _____

_____

2. _____

_____

**(2)**

(ii) Explain why the performance of a bus local area network such as Ethernet degrades with increase in network traffic.

_____

_____

_____

_____

**(2)**

(iii) Explain how switched Ethernet overcomes this problem.

_____

_____

_____

**(2)**

**(Total 10 marks)**

**Q30.**

(a) Data communication involves sending and receiving data. This can be either serial or parallel transmission. What is meant by:

(i) serial transmission of data;_____

_____

**(1)**

(ii) parallel transmission of data?_____

_____

**(1)**



(b) Explain the term *baud rate* in the context of data transmission.

_____

_____

**(1)**

(c) A computer system uses even parity. The most significant bit is used as a parity bit. The ASCII code of the character '&' is decimal number 38.

(i) What would be the 8-bit binary pattern transmitted if the character '&'is sent?

_____

**(2)**

(ii) Asynchronous data transmission is used if one character is sent at a time. One start bit marks the beginning of a character and two stop bits mark

the end of a character.
What would be the bit pattern if the character '&'is sent using asynchronous data transmission?

_____

**(1)**

**(Total 6 marks)**

## Q31.

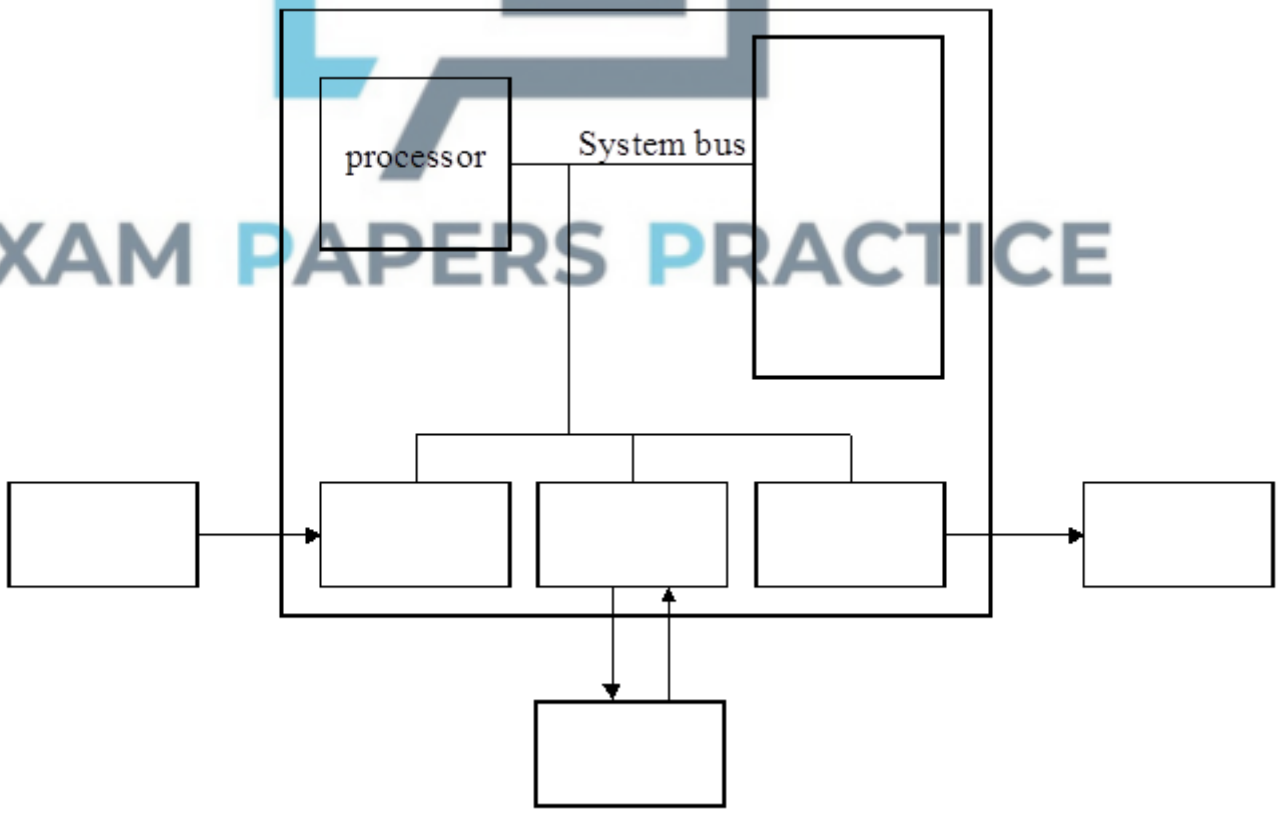
(a) Some of the components of a computer system are:

Memory:
main memory 1

Peripherals:
keyboard 2
monitor 3
hard disk drive 4

I/O Ports:
keyboard controller 5
disk controller 6
VDU controller 7

In the diagram, name the components by writing the number into the appropriate box.






**(4)**

(b) The above computer system uses the *stored program concept.* Explain this term.

_____

_____

_____

_____

**(2)**

(c) Many computer systems and printers have both serial and parallel ports. Data can be sent to a printer from either port. What is meant by:

(i) serial transmission of data; _____

_____

**(1)**

(ii) parallel transmission of data. _____

_____

**(1)**

(d) (i) When could parallel data transmission be used?

_____

**(1)**

(ii) Justify the answer you have given in (d) (i). _____

_____

**(1)**

(e) Asynchronous data transmission is a method of data transmission in which a character is sent as soon as it becomes available, for example when a key is pressed on the keyboard. In this situation, what is the reason in having the start and stop bits?



_____

_____

_____

_____

**(2)**

**(Total 12 marks)**

## Q32.

Describe:

(i) *serial* transmission of data;

_____

_____

**(1)**

(ii) *parallel* transmission of data

_____

_____

**(1)**

**(Total 2 marks)**

## Q33.

Using an example in **each** case, explain what is meant by:

(a) serial data transmission,

_____

_____

_____

_____

**(2)**

(b) parallel data transmission.

_____

_____

_____

_____

**(2)**

**(Total 4 marks)**