



NCC EDUCATION

**INTERNATIONAL DIPLOMA
IN
COMPUTER STUDIES**

**FUNDAMENTALS OF HARDWARE
AND
OPERATING SYSTEMS**

MARCH 2009 - LOCAL EXAMINATION

MARKING SCHEME

Markers are advised that many answers in Marking Schemes are **examples only** of what we might expect from candidates. Unless a question **specifically states** that an answer is demanded in a particular form, then an answer that is correct, factually or in practical terms, must be given the available marks.

If there is doubt as to the correctness of an answer the relevant NCC Education textbook should be the first authority.

This Marking Scheme has been prepared as a guide only to markers. This is **ABSOLUTELY NOT** a set of model answers; **NOR** is the Marking Scheme exclusive, for there will frequently be alternative responses which will provide a valid answer.

Throughout the question, please credit any valid alternative point.

Notice to Markers

Where markers award half marks in any part of a question they should ensure that the total mark recorded for a question is a whole mark.

SECTION A**ANSWER ALL QUESTIONS IN THIS SECTION****Marks****QUESTION 1****4**

Briefly describe the purpose of an *expansion slot* and give TWO (2) examples of an expansion slot.

Answer *Most PCs use standardised slot connectors that enable various types of peripheral devices to be attached to the system. Optional input/output devices, or their interface adapter boards, are plugged into these slots to connect the devices to the system's address, data, and control buses.*
(2 marks)

The major expansion slot types are as follows:

- *8 bit PC-bus slots*
- *16-bit AT-bus or industry standard Architecture (ISA) bus slots*
- *32 bit Extended ISA (EISA) and Micro Channel Architecture (MCA) slots.*
- *32-bit Video Electronics Standards Association (VESA) and 32/64 – bit peripheral Component Interconnect (PCI) local bus slots.*

(any two, 1 mark each, max 2 marks)

QUESTION 2**4**

List FOUR (4) types of PC adapter card.

Answer

- *Video Adapter Cards*
- *Modems*
- *Local area network cards*
- *Sound cards*

(1mark each, max 4 marks)

QUESTION 3**4**

Distinguish between *serial ports* and *parallel ports* in a computer.

Answer *Serial ports send the data in individual bits and transmit them, one at a time, in a serial bit stream over a single conductor. In this manner, the number of conductors connecting the computer and the peripheral is reduced from eight or more data lines and any number of control lines to one or two communications lines, a ground line, and maybe a few control lines.*

(2 marks)

Parallel ports are used for connecting printers and other parallel devices to the computer. A typical parallel printer connection allows the computer to pass information to the printer, 8 bits at a time, across the eight data lines. The other lines in the connection carry control signals (handshaking signals) back and forth between the computer and the printer.

(2 marks)

QUESTION 4**4**

Briefly explain the use of *virtual memory* in a computer.

Answer *Virtual memory is actually space that is manipulated to seem like RAM*

2

Software creates virtual memory by swapping files between RAM and the disk drive. This memory-management technique effectively creates more total memory for the system's applications to use.

2

(4 marks)

QUESTION 5**4**

Briefly describe the purpose of an *infrared port* in a computer.

Answer

- *Provides short range connectivity for IrDA compliant devices such as printers and PDAs.*
- *Particularly useful for portable computers such as notebooks allowing easy connection with a number of peripheral devices.*

(2 mark each, max 4 marks)

QUESTION 6**4**

Briefly describe the hard disk drive's fragmentation process.

Answer

- *Files are stored in non-contiguous location.*
- *Happens when files are stored, rewritten, etc.*
- *Due to difference in size of before and after files.*
- *HDD unable read efficiently.*

(1 mark each, max 4 marks)

QUESTION 7**4**

Briefly describe the purpose of an *integrated drive electronics (IDE)* interface in a computer.

Answer

- *The Integrated Drive Electronics (IDE) interface is a system-level interface.*
- *The IDE interface places most of the controller electronics on the drive unit.*
- *Therefore, data travels in a parallel format between the computer and the drive unit.*
- *The controller circuitry on the drive handles all the parallel-to-serial and serial-to-parallel conversions necessary to place the data on the actual disk.*

(1 mark each, max 4 marks)

QUESTION 8**4**

Explain the purpose of a *bootstrapping process* in a computer.

Answer

- *Bootstrapping is a process to load the operating system into RAM.*
- *Bootstrapping is a process in which the operating system is loaded into memory by a smaller program called the bootstrap loader.*
- *The operating system can be loaded from a ROM chip, floppy disk, hard-disk drive, or another computer.*
- *Loading the more powerful operating system files from the disk increases the system's onboard intelligence considerably.*

(1 mark each, max 4 marks)

QUESTION 9**4**

Describe the purpose of a *Small Computer Systems Interface (SCSI)* in a computer.

- Answer*
- *The SCSI is a specially designed interface that allows for a very high speed transfer of data between disk drive and computer.*
 - *This makes the maintenance and repairs simpler because the power to the workstation does not have to shut off.*
 - *The original SCSI specification makes provisions for 8-bits parallel data transfers.*
 - *It can be used to connect controller to a hard disk, CD-ROM, Scanner etc.*
 - *The maximum speed of the SCSI-1 bus is 5MBps.*
- (1 mark each, max 4 marks)*

QUESTION 10**4**

List FOUR (4) common virus symptoms.

- Answer*
- *Hard disk controller failure*
 - *Disks are full even after deleting the files*
 - *Systems cannot read/write protected disks*
 - *Hard disk stops booting*
- (1 mark each, max 4 marks)*

Total 40 Marks

SECTION B

ANSWER ANY TWO QUESTIONS

QUESTION 1

Marks

Throughout the question, please credit any valid alternative point.

a) Briefly explain the elements of a system's primary memory. 9

- Answer*
- **RAM-Random access memory**
 - **Quick enough to operate directly with the microprocessor and can be read from and written to as often as desired.**
 - **RAM is a volatile type of memory; its contents disappear when power is removed from the memory.**

 - **ROM – Read only memory (ROM)**
 - **Contains the computer's permanent startup programs.**
 - **ROM is non volatile; its contents remain with or without power being applied.**

 - **Cache Memory**
 - **An area of special high-speed RAM reserved for improving system performance by holding information that the microprocessor is likely to use.**
 - **Blocks of often-used data are copied into the cache area to permit faster access times.**

(1 mark each, max 9 marks)

b) Briefly describe the structure and operation of a *liquid crystal display (LCD)* in a computer. 9

- Answer*
- **They are relatively thin, flat, and lightweight, and require very little power to operate.**
 - **In addition to reduced weight and improved portability.**
 - **They offer better reliability and longer life than CRT units.**
 - **The LCD panel is constructed by placing thermotropic liquid crystal material between two sheets of glass.**
 - **A set of electrodes is attached to each sheet of glass. Horizontal (row) electrodes are attached to one glass plate; vertical (column) electrodes are fitted to the other plate.**
 - **These electrodes are transparent and let light pass through.**
 - **A picture element, or pixel, is created in the liquid crystal material at each spot where a row and a column electrode intersect.**
 - **A special plate called a polariser is added to the front and back of the display.**
 - **The complete LCD panel is mounted in a frame that also contains the control circuitry for the panel's electrode matrix.**

(1 mark each, max 9 marks)

c) Explain the difference between *half-duplex* and *full-duplex* communication modes. 2

- Answer*
- In half-duplex mode, the communication is possible in both directions but not at the same time.**
In full-duplex mode, the communication is possible in both directions at the same time.
 (1 mark each, max 2 marks)

d) Briefly explain the use of *Hyper Text Transfer Protocol (HTTP)* and *File Transfer Protocol (FTP)* in a computer network. **10**

- Answer**
- *HTTP, or Hypertext Transfer Protocol, is a client/server protocol used to send and receive files on the internet.*
 - *A client is any network workstation that sends a request to a Web server.*
 - *A client may be a standalone computer connected to the Internet through an ISP, or it may be a workstation o a network that is connected to the Internet through an ISP.*
 - *Nearly any file type can be sent using HTTP. HTTP consists of a request-response process. This means that a client initiates a request to a server for files contained at the server, and the server responds to the request by sending the files.*
 - *Before the client can send a request, it must be running the HTTP protocol. HTTP is packaged with all Web browsers and is the default protocol with browsers such as Microsoft Internet Explorer and Netscape.*
- (1 mark each, max 5 marks)*

FTP:

- *FTP is used to upload and download information to and from the WWW.*
 - *FTP is a client/server type of software application. The server version runs on the host computer, and the client version runs on the user's station.*
 - *To access an FTP site, the user must move into an FTP application and enter the address of the site to be accessed.*
 - *After the physical connection is made, the user must log on to the FTP site by supplying an account number and password.*
 - *When the host receives a valid password, a communication path opens between the host and user site, and an FTP session begins.*
- (1 mark each, max 5 marks)*

Total 30 Marks

QUESTION 2**Marks****Throughout the question, please credit any valid alternative point.**

- a) Briefly describe FOUR (4) methods that could be used to initiate data transfer between the system and its peripherals. **12**

Answer **Polling-** *The microprocessor examines the status of the peripheral under program control. Software periodically checks the system's I/O devices to see if any is ready for data transfer.*

Programmed I/O – The microprocessor alerts the designated peripheral by applying its address to the system's address bus. Calls the microprocessor to alert the peripheral of an I/O operation but the peripheral can delay by asserting its busy line.

Interrupt-driven I/O – The peripheral alerts the microprocessor that it's ready to transfer data. Each device can issue its own IRQ signal and is issued with its own IRQ number.

Direct Memory Access (DMA) – The intelligent peripheral assumes control of the system's buses to conduct direct transfers with primary memory. The DMA controller is a specialised controller that can conduct the transfer much faster than a standard microprocessor.

(3 marks each, max 12 marks)

- b) Explain what an IP address is. **3**

Answer

- *The blocks of internet access addresses that ISPs provide to their customers are called Internet Protocol addresses, or IP addresses. The IP address makes each site a valid member of the Internet.*
- *This is how individual users are identified to receive file transfers, email, and file requests.*
- *IP addresses exist in the numeric format of xxx.yyy.zzz.aaa. Each address consists of four 8-bit field (octets) separated by dots (.). This format of specifying addresses is referred to as dotted-decimal notation. The decimal numbers are derived from the binary address that the hardware understands.*

(1 mark each, max 3 marks)

- c) Briefly explain the different classes of IP address used in LANs. **9**

Class-A addresses are reserved for large networks and use the last 24 bits (the last three octets or fields) of the address for the host addresses. The first octet always begins with a 0, followed by a 7 bit number. Therefore, valid class-A addresses range between 001.x.x.x. and 126 .x.x.x. This permits a class-A network to support 126 different networks with nearly 17 million hosts (nodes) per network.

Class-B addresses are assigned to medium-sized networks. The first two octets can range between 128.x.x.x and 191.254.0.0. The last two octets contain the host addresses. This enables class-B networks to include up to 16,384 different networks with approximately 65,534 hosts per network.

Class-C addresses are normally used with smaller LANs. In a class-C address, only the last octet is used for host addresses. The first three octets can range between 192.x.x.x and 223.254.254.0. Therefore, the class-C address can support approximately 2 million networks with 254 hosts each.

(3 mark each, max 9 marks)

d) Explain the difference between the low-level and high-level formatting operations of a magnetic disk. **6**

- Answer*
- *When a magnetic disk is manufactured, it is blank.*
 - *Low-level formatting is the process in which the most fundamental structures and electronic markers are placed on the disk surface*
 - *These are reference points that mark the beginnings and endings of sectors around the tracks of the disk.*
 - *This function is performed along with the high-level format on a floppy disk.*
 - *However, the low-level formatting for modern hard-disk drives is performed by the drive manufacturer and is good for the life of the drive.*
 - *In a high-level formatting operation, the operating system places its disk-management structures on the disk.*

(1 mark each, max 6 marks)

Total 30 Marks

QUESTION 3**Marks****Throughout the question, please credit any valid alternative point.**

a) Briefly explain the use of *USB* and *FireWire* in a computer. 6

Answer *Universal Serial Bus:*

A new serial interface standard, called the Universal Serial Bus (USB), has been developed to provide a fast, flexible method of attaching up to 127 peripheral devices to the computer. The USB provides a connection format designed to replace the system's traditional serial-and parallel-port connections.

The FireWire bus is similar to USB in that devices can be daisy-chained to the computer using a single connector and host adapter. It requires a single IRQ channel, an I/O address range, and a single DMA channel to operate. Fire wire is also capable of using the high speed isochronous transfer mode described for USB to support data transfer rates up to 400 Mbps. Its high speed capabilities make FireWire well suited for handling components, such as video and audio devices, which require real-time, high speed data transfer rates.
(3 marks each, max 6 marks)

b) Explain the purpose of a modem in a computer network. 4

Answer • *A modem allows a computer to communicate with other computers through the telephone lines.*

• *A modem consists of two major blocks: a modulator and a demodulator.*

• *The modulator is a transmitter that converts the parallel/digital computer data into a serial/analogue format for transmission.*

• *The demodulator is the receiver that accepts the serial/analogue transmission format and converts it into a parallel/digital format that can be used by the computer or peripheral.*

(1 mark each, max 4 marks)

c) List FIVE (5) basic steps that should be considered before installing a new operating system on a hard drive. 5

Answer *1. Partition the drive for use with the operating system.*

2. Format the drive with the basic operating system files.

3. Run the appropriate setup utility to install the complete operating system.

4. Load all the drivers necessary for the operating system to function with the system's installed hardware devices.

5. Reboot the system to activate all the system components.

(1 mark for each point, max 5 marks)

d) Describe the operation and purpose of *Wireless local area networks (WLANs)*. 6

Answer • *Wireless local area networks (WLANs) are used for connecting devices in residential and small office environments.*

• *Wireless LAN's provide the maximum amount of flexibility for connecting networking components and, because no wires are required, they provide the users with considerable mobility.*

• *Wireless is also becoming an economical choice for locations where installing cable is not practical or prohibited by historic building codes or other restrictions.*

• *The access point is the mainstay of the wireless network. These devices serve as the central connection point for all the network devices with its range.*

• *The access point also provides the physical connections with wired networks.*

• *The access point can be connected to a host computer that is a node on an existing hard-wired network, or it can be connected directly into a connectivity device such as a network hub or router.*

(1 mark for each point, max 6 marks)

- e) Describe THREE (3) ways of performing backup operations to create copies of important information. **9**

Incremental backup:

The system backs up files that have been created or changed since the last backup. Restoring the system from an incremental backup requires the use of the last full backup and each incremental backup made since then: this method requires the least amount of time to back up the system but the most amount of time to restore it.

(3 marks)

Daily backup:

To conduct a daily, or copy, backup, we need to move through the tree structure of the disk and mark, or tag, directories and files to be backed up. After all the desired directories/files have been marked, they are backed up in a single operation.

(3 marks)

Differential backup:

Specifying a differential, or modified-only, backup causes the backup utility to examine each file to determine whether it has changed since the last full backup was performed. If not, it is bypassed. If the file has been altered, however, it will be backed up. This option is a valuable time-saving feature in a periodic backup strategy. To restore the system you need a copy of the last full backup and the last differential backup.

(3 marks)

Total 30 Marks