NCC EDUCATION

INTERNATIONAL DIPLOMA
IN
COMPUTER STUDIES

COMPUTER TECHNOLOGY

5th March 2006

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.

Notice to Markers

Where markers award half marks in any part of a question they should ensure that the <u>total</u> mark recorded for a question should be a whole mark.

For each question enter ONE capital letter ONLY in your answer booklet.

Marks

QUESTION 1   **1**

In a manufacturing business, the assembly of the product is an example of:

A) a service activity   **C)** operations

B) outbound logistics   **D)** inbound logistics

Answer   C

QUESTION 2   **1**

Ideally in a business:

A) the IT strategy is based on the business strategy   **C)** the business strategy is based on the IT resources

B) the business strategy is based on the IT strategy   **D)** the external IT environment is based on the business strategy

Answer   A

QUESTION 3   **1**

In a computer system, *main memory* refers to:

A) ROM   **C)** the processor

B) RAM   **D)** the hard disk

Answer   B

QUESTION 4   **1**

A certain storage disk has data written to it on 80 concentric tracks. This disk is:

A) a floppy disk   **C)** a DVD

B) a CD-R   **D)** a CD-RW

Answer   A

QUESTION 5   **1**

Multi-access systems must make use of:

A) virtual memory   **C)** memory paging

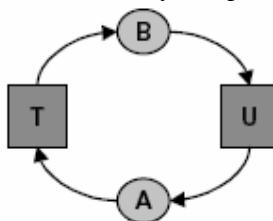**B)** batch processing   **D)** time sharing

Answer   D

QUESTION 6   1
The diagram illustrates a situation that has to be handled by an operating system.

Process A is waiting for resource T, which is currently held by process B.

Process B is not about to release resource T because it is waiting for resource U, held by A

In this situation, the result will be:
A)   process A will give up resource U   **C)**   both processes will wait forever
B)   process B will give up resource T   **D)**   both processes will terminate
Answer   C

QUESTION 7   1
The following operations are carried out on a positive binary two's complement integer (whole number).

Change all the 1s to 0 and all the 0s to 1s.
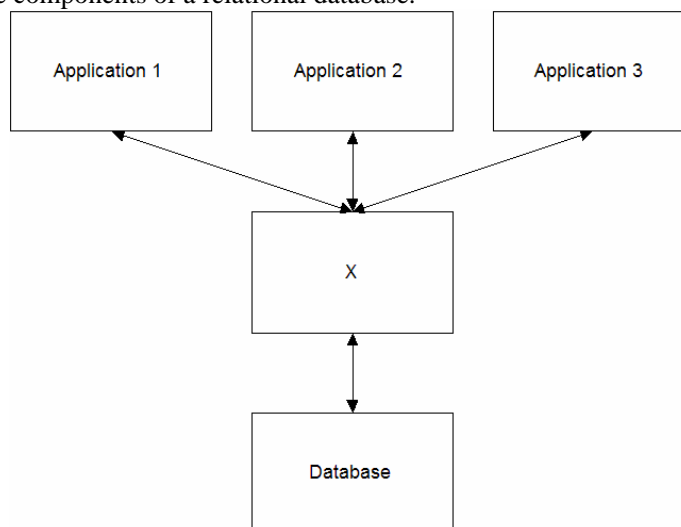Add 1 to the result.

The result is:
A)   the number is doubled   **C)**   the number is changed to a negative
B)   the number is halved   **D)**   the number is converted to BCD.
Answer   C

QUESTION 8   1
The diagram shows some components of a relational database.

The component marked X is:
A)   the data dictionary   **C)**   a query
B)   a table   **D)**   the database management system
Answer   D

QUESTION 9   1
Connectionless mode communication is suitable for:

A)   making a telephone call

B)   sending an e-mail

C)   a session working with a remote computer from a terminal

D)   downloading a data file from a mainframe to a terminal

Answer   B

QUESTION 10   1
MP3 is:

A)   an algorithm used to compress music files

B)   a compression standard for still images

C)   a portable music player

D)   an operating system

Answer   A

SECTION A – 2
ANSWER ALL QUESTIONS FROM THIS SECTION
EACH QUESTION REQUIRES MORE THAN ONE RESPONSE

QUESTION 11   3
Businesses can be assessed according to the information content of their products. Using the scale of LOW, MEDIUM and HIGH, state the level of the information content of the products from the following businesses:

a) education

b) airlines

c) mining

Answer   a)medium, b)high, c)low
*   any 3 points, 1 mark each.*

QUESTION 12   3
The following are activities that have to be dealt with in a defined time period.

a) preparation of tomorrow's delivery schedule

b) provision of personal data to customers for checking

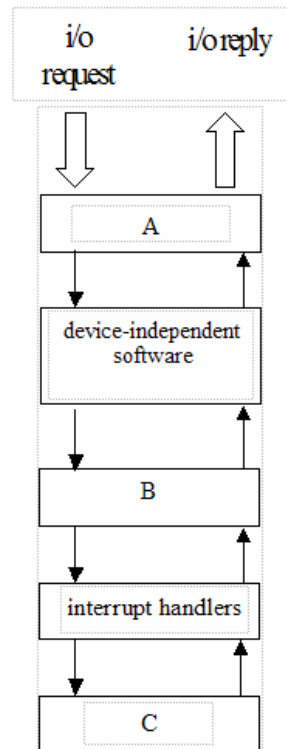c) response to readings from altitude sensors by an autopilot in an aircraft

Match these activities with the correct description of the time frame within which it has to be dealt with.

i) weekly

ii) conversational

iii) convenient

iv) non-urgent

v) daily

vi) immediate

Answer   a)v, b)iv, c)vi
*   1 mark each, max 3.*

QUESTION 13   3

The following diagram shows how input and output functions are layered in a computer system, with the involvement of parts of the operating system.

```
   i/o          i/o reply
 request
      ⬇      ⬆
  ┌─────────────────┐
  │       A         │
  └─────────────────┘
      │         ▲
  ┌─────────────────┐
  │ device-independent │
  │    software     │
  └─────────────────┘
      │         ▲
  ┌─────────────────┐
  │       B         │
  └─────────────────┘
      │         ▲
  ┌─────────────────┐
  │ interrupt handlers │
  └─────────────────┘
      │         ▲
  ┌─────────────────┐
  │       C         │
  └─────────────────┘
```

Identify the components labelled A, B and C. Choose from
i) hardware
ii) user processes
iii) device drivers
iv) registers
v) memory management processes
Answer   a)ii), b)iii), c)i)
1 mark each max 3.

QUESTION 14   3
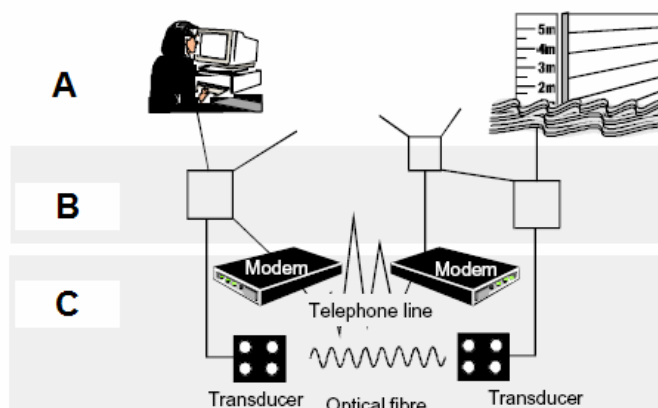
Convert the denary number 122 to
a) eight bit two's complement binary
b) BCD
c) hexadecimal
Answer   a) 01111010 (all eight bits must be given), b) 0001 0010 0010, c) 7A
1 mark each max 3.

QUESTION 15　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**3**
The diagram shows the layout of a computer-controlled operation that remotely monitors river levels.

Identify the layers A, B and C. Choose from
i) presentation
ii) physical
iii) application
iv) network
v) session
Answer　a)iii), b)iv, c)ii
　　　1 mark each, max 3.

QUESTION 16　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**3**
A multimedia computer system that involves moving images must have which THREE of the following?
a) a CD drive
b) a display unit with fast refresh rate
c) decompression software
d) a GUI-capable operating system
e) broadband access to the internet
f) a dedicated sound card
Answer　b), c), d)
　　　1 mark each max 3.

QUESTION 17　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**3**
A resource on the internet is accessed by using the following URL:

http://www.nccedu.com/courses.html

Identify
a) the protocol used
b) the domain name
c) the file name
Answer　a)http (hypertext transfer protocol), b)nccedu.com, c)courses.html
　　　1 mark each max 3.

QUESTION 18 3

Which THREE of the following are transaction-processing systems?

a) sales order processing

b) stock control

c) medical reports

d) producing teaching notes

e) producing engineering drawings

f) payroll

Answer   a), b), f)

1 mark each, max 3.

QUESTION 19 3

Which THREE of the following are most likely to be found on a typical office worker's PC system?

a) e-mail server

b) e-mail client

c) presentation software

d) web browser

e) the company database

f) network monitoring tools

Answer   b), c), d)

1 mark each, max 3.

QUESTION 20 3

Which THREE of the following actions are carried out by the Arithmetic Logic Unit (ALU)?

a) comparing two letters to determine alphabetical order

b) multiply two numbers

c) divert program control as the result of a logical test

d) store the intermediate results of a calculation

e) instruct an input device to read data

f) decode a program instruction

Answer   a) , b), c)

1 mark each, max 3.

Total 40 Marks

QUESTION 21   Marks

<mark>Throughout the question, please credit any valid alternative point.</mark>

a) i) Specify THREE actions that cause delay when data is being read from a hard disk. **3**
- *read-write head moves to required track / seek time*
- *data segments rotates to below head / rotational delay / latency*
- *data segments are read / data transfer*

any 3 points, 1 mark each, max 3.

ii) Explain how RAID disk systems can contribute to greater safety for data. **3**
- *data copied to more than one disk*
- *mirror images*
- *data may be spread across more than one disk*
- *if one disk fails, data may be recovered from mirror image*
- *(or) data may be reconstructed from remaining disks*

any 3 points, 1 mark each, max 3.

iii) Many new PCs are produced without floppy disk drives. Explain why floppy disks are less in **3**
favour than in the past.
- *low capacity*
- *file sizes tending to increase*
- *slow*
- *not robust / data can be lost easily / easily damaged*
- *wear out quite quickly*

any 3 points, 1 mark each, max 3.

b) i) Comment on TWO factors that affect the performance of a cathode ray monitor. **4**
- *size*
- *measured diagonally across the screen*
- *bigger screens helpful for graphics / designs*
- *resolution*
- *number of dots / pixels*
- *measured vertically <u>and</u> horizontally*
- *more dots, better resolution*
- *dot pitch*
- *distance between dots <u>between</u> pixels*
- *scan / refresh rates*
- *faster reduces flicker*
- *important for moving images*

any 4 points, 1 mark each max 4.

ii) Explain why liquid crystal display screens are superseding cathode ray screens. **4**
- *take less space on the desk*
- *use less power*
- *lighter*
- *don't generate heat*
- *more reliable*

any 4 points, 1 mark each max 4.

c)   Dot matrix printers are slow and noisy. They have been around since the earliest days of PCs.   **3**
Explain why they are still in use.
- *useful for multi-part stationery*
- *can produce instant carbon copies*
- *because impact printers*
- *use pressure to make image*
- *useful for credit card receipts*
- *useful for traders' bills*
- *useful for accounting / legal copies required*
- *very cheap ink / ribbons cheaper than ink jet cartridges / laser toner.*
any 3 points, 1 mark each max 3.

Total 20 Marks

a) i) What is a sequential file? **2**
- *a file where the records are arranged in order*
- *order based on a particular field / attribute*
- *field chosen is often the key field*
- *may be based on more than one field*

any 4 points, 1 mark each, max 4.

ii) Explain how a new record is added to a sequential file. **4**
- *new file started*
- *records copied from old file to new file*
- *until insertion point reached*
- *write new record to new file*
- *write rest of old file to new file*

any 4 points, 1 mark each, max 4.

iii) Explain how a particular record is found in a sequential file. **4**
- *examine record at mid point*
- *compare with key*
- *if key = record then found*
- *(else) if required key is larger than record found, find record at mid point in top half of file*
- *(else) if required key is smaller than record found, find record at mid point in bottom half of file*
- *repeat until found*
- *or no more records*

any 4 points, 1 mark each, max 4.

iv) What is an indexed sequential file? **4**
- *a sequential file plus an index file*
- *index file contains key values*
- *and pointers*
- *pointers locate the record in the main file*
- *no need to have an index entry for each value*
- *can divide data into pages*
- *may be multiple levels of index*
- *may have overflow area*
- *some records will not fit into allocated block*

any 4 points, 1 mark each, max 4.

v) Explain why it is quicker to find records in an indexed sequential file than in a non-indexed sequential file. **2**
- *fewer comparisons made*
- *look up data item in index*
- *jump straight to record required (or page required)*

any 2 points, 1 mark each, max 2.

vi) Explain the circumstances where the operation of an indexed sequential file can be unacceptably slow.

2

- *when there are frequent additions (or deletions)*
- *index needs rebuilding each time*
- *may be many records in overflow*
- *requiring more disk accesses*

any 2 points, 1 mark each, max 2.

b) In a certain random access file, one record is stored per disk address (block). A hashing algorithm is used to locate the records on the disk. The hashing algorithm takes the last three digits of the record key to generate a disk address. Thus, the filing system will attempt to store record 123456 at disk address 456. Assuming an empty file to start with, determine the disk addresses of the records with the following keys:

2

165687
534867
756687
534688

- *165687 → 687*
- *534867 → 867*

both in correct place 1 mark

- *756687 → 688*
- *534688 → 689*

both in correct place 1 mark
max 2 for the question
if record keys not given, award marks if order is clear.

Total 20 Marks

QUESTION 23   **Marks**
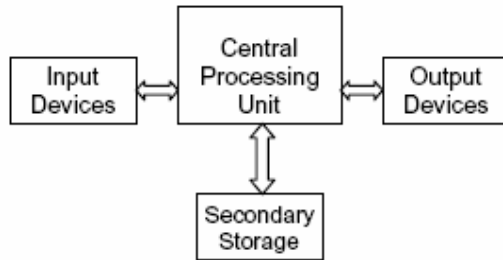
a) i) More and more people are teleworking, that is working from home using computers and electronic   **2**
communications. State TWO advantages of this to the teleworker.
- *can work at times to suit oneself*
- *save travelling time*
- *save travelling cost*
- *can live anywhere*

any 2 points, 1 mark each, max 2.

ii) Apart from a standard PC, state TWO other resources that a teleworker needs in order to work at   **2**
home.
- *communication link*
- *ISP / other provider*
- *modem*
- *router*
- *browser*
- *suitable application software (or example)*
- *e-mail software*

any 2 points, 1 mark each, max 2.

iii) The teleworker may need to access the employer's intranet. Explain what is meant by an intranet.   **2**
- *internal information system*
- *uses internet technology*
- *such as HTML pages*

any 2 points, 1 mark each, max 2.

iv) Explain what a firewall is and why the employer may find it necessary to install one in this situation.   **4**
what it is
- *hardware / software / a combination of hardware and software*
- *placed between a computer / network and a connection to an outside network / internet*

purpose
- *to prevent unauthorised access / hacking / cracking*
- *to limit IP addresses that can access the network*
- *to limit IP addresses accessed by the network*

any 4 points, 1 mark each, max 4.

b) Many networks are built using ethernet technology. This allows any device on the network to   **4**
transmit signals at any time.   Explain why this can sometimes cause a problem and how such
problems are dealt with.
problem
- *collisions*
- *messages corrupted*

solutions
- *lengths of message constrained*
- *length of cable limited*
- *retransmit*
- *after random length of time*

any 4 points, 1 mark each, max 4.

c) i) Explain the difference between connecting to the internet with an ISDN line and a leased line. **4**

ISDN
- *dial-up*
- *opens when needed / shut down when not needed*
- *high capacity*
- *voice and data*
- *lower running cost if low demand*

any 2 points, 1 mark each, max 2.

leased line
- *open all the time*
- *higher fixed costs than ISDN*
- *lower running costs if high demand (only allow if last point in ISDN list not given)*

any 2 points, 1 mark each, max 2.

ii) Explain why ISDN can be a suitable method for transmitting multimedia presentations. **2**
- *high bandwidth*
- *multimedia files are large*
- *reduces download time*

any 2 points, 1 mark each, max 2.

Total 20 Marks

Throughout the question, please credit any valid alternative point.

a)   i)   Draw a simple block diagram to show how a computer central processing unit, secondary storage,   **4**
input devices and output devices relate to each other.
diagram for reference

marking points (must be on diagram)
- *cpu labelled*
- *input devices (or one example) connects to cpu and nowhere else*
- *output devices (or one example) connects to cpu and nowhere else*
- *secondary storage connects to cpu and nowhere else*
- *all arrows shown – must be bi-directional*

1 mark each point, max 4.

    ii)   Briefly state the main stages of the fetch-execute cycle   **5**
- *the address of the next instruction to be executed is held in the program counter register*
- *this instruction is fetched into the CPU*
- *the instruction is then copied into the instruction register*
- *the contents of the program counter register are incremented*
- *program counter points to the next instruction.*
- *the instruction in the instruction register is decoded*
- *the instruction is executed*

any 5 points, 1 mark each, max 5.

b)   State THREE different types of data that may be represented by one byte of storage.   **3**
examples
- *a character*
- *a number / integer*
- *a true / false value*
- *a date / time*
- *a (part of) program instruction*
- *a pixel*
- *a part of a sound*

any 3 points, 1 mark each, max 3.

c) i) State THREE examples of signals that may be sent along a computer's control bus.　　　**3**

- *memory write*
- *memory read*
- *I/O write*
- *I/O read*
- *transfer acknowledge (to confirm that the data signals have been transferred)*
- *bus request*
- *bus grant*
- *interrupt request*
- *interrupt acknowledge*
- *clock (to synchronise operations)*
- *reset (initialises all the components)*

any 3 points, 1 mark each, max 3.

ii) A computer processes instructions that are 32 bits wide.　Explain the effect on the computer's performance if the data bus is 16 bits wide.　　　**2**

- *performance is slowed*
- *requires two memory accesses per cycle*

1 mark each, max 2.

iii) What is the maximum memory size of a computer system that has an address bus of width 16 bits?　　　**1**

65536 bytes / 64 K.

iv) State TWO circumstances that might lead to an interrupt being generated.　　　**2**

- *program error e.g. overflow, division by zero, attempting to execute an illegal instruction*
- *timer e.g. end of time slice*
- *i/o e.g. operation completed or error condition*
- *hardware problem e.g. printer out of paper, memory parity error, power failure*

any 2 points, 1 mark each, max 2.

Total 20 Marks

Specification Grid IDCS SD September 2005

Section A1	Obj A	Obj B	Obj C	Obj D	Obj E	Obj F	Obj G	Obj H	Obj I	Page reference "Systems Development" (NCC Education Ltd, 2001)
Q1	1									8
Q2	1									12
Q3		1								37
Q4			1							60
Q5					1					119
Q6					1					136
Q7						1				152
Q8						1				172
Q9							1			196
Q10									1	248
total A1	**2**	**1**	**1**	**0**	**2**	**2**	**1**	**0**	**1**	**10 marks**
Section A2	Obj A	Obj B	Obj C	Obj D	Obj E	Obj F	Obj G	Obj H	Obj I	page reference
Q11				3						98
Q12				3						105
Q13					3					135
Q14						3				152-153
Q15							3			192
Q16									3	244
Q17								3		225 et seq
Q18	3									29
Q19	3									30
Q20		3								38-39
total A2	**6**	**3**	**0**	**6**	**3**	**3**	**3**	**3**	**3**	**30 marks**
total Section A	**8**	**4**	**1**	**6**	**5**	**5**	**4**	**3**	**4**	**40 marks**

Section B	Obj A	Obj B	Obj C	Obj D	Obj E	Obj F	Obj G	Obj H	Obj I	page reference
Q21a)i)			3							61
Q21a)ii)			3							62
Q21a)iii)			3							63
Q21b)i)			4							78
Q21b)ii)			4							79
Q21c)			3							81
Q22a)i)						2				161
Q22a)ii)						4				162
Q22a)iii)						4				162
Q22a)iv)						4				162
Q22a)v)						2				163
Q22a)vi)						2				163
Q22b)						2				165
Q23a)i)	2									27
Q23a)ii)							2			190 et seq
Q23a)iii)	2									26
Q23a)iv)							4			201
Q23b)							4			204
Q23c)i)							4			206
Q23c)ii)									2	244 et seq
Q24a)i)		4								36
Q24a)ii)		5								43
Q24b)		3								44
Q24c)i)		3								48
Q24c)ii)		2								49
Q24c)iii)		1								49
Q24c)iv)		2								50
total B	**4**	**20**	**20**	**0**	**0**	**20**	**14**	**0**	**2**	**60 marks**