NCC EDUCATION

INTERNATIONAL DIPLOMA
IN
COMPUTER STUDIES

COMPUTER TECHNOLOGY

4th June 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 total mark recorded for a question should be a whole mark.

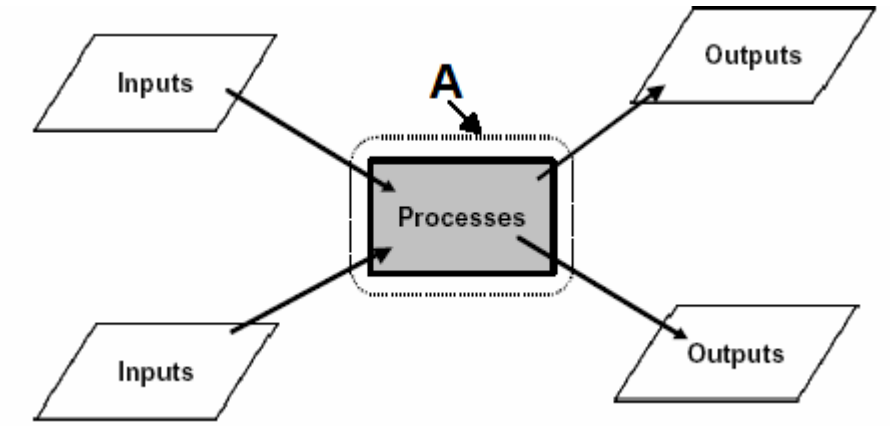
SECTION A - 1

ANSWER ALL QUESTIONS FROM THIS SECTION
EACH QUESTION REQUIRES ONE RESPONSE ONLY

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

Marks

QUESTION 1 **1**



In the diagram, the layer marked with the letter A represents

A) the user interface
B) the system boundary
C) the operating system
D) the application

Answer B

QUESTION 2 **1**

A transaction processing system is an example of which type of information system?

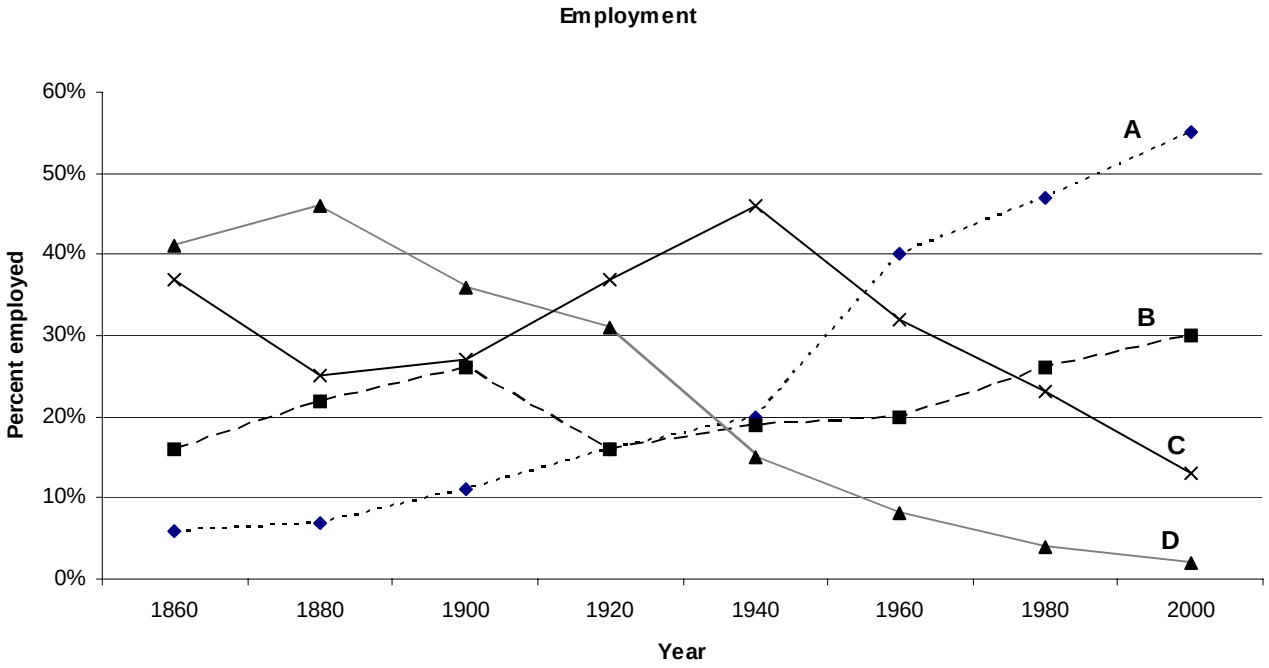
A) strategic system
B) managerial system
C) operational system
D) expert system

Answer C

Marks

QUESTION 3 **1**

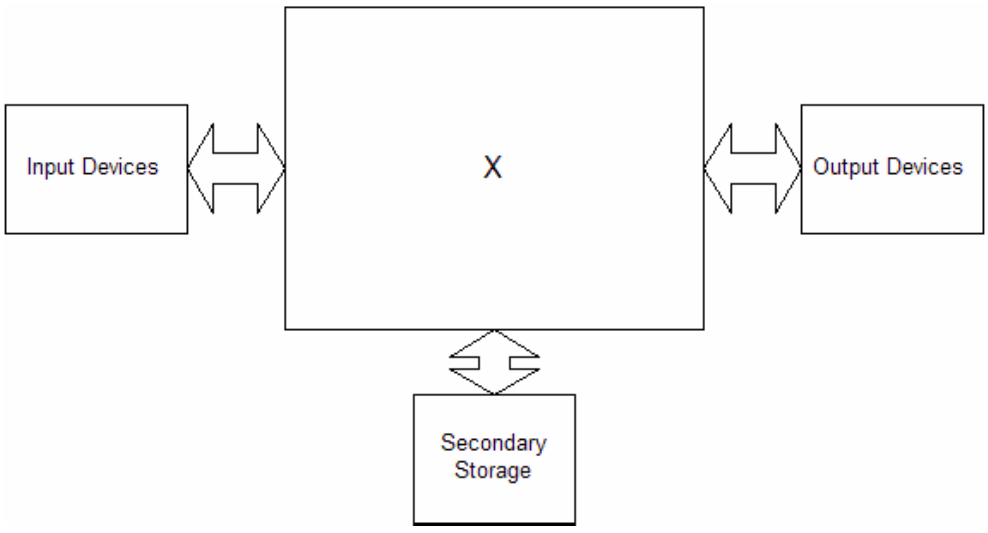
The graph shows the percentage of the US workforce employed in various industries since 1860. Which line, chosen from A, B, C and D shown on the diagram, represents employment in services and information?



Answer ***A***

QUESTION 4 **1**

The diagram shows some components of a computer system.



Identify the component labelled with an X.

A) operating system
B) device drivers
C) central processing unit
D) hard disk drive

Answer ***C***

Marks

QUESTION 5 **1**

When data is input into a computer system, it is initially held prior to processing in

A) disk storage
B) ROM
C) CD-RW
D) RAM

Answer D

QUESTION 6 **1**

A 16-bit processor can manipulate data values up to a maximum of

A) 127
B) 255
C) 65,535
D) 4,294,967,295

Answer C

QUESTION 7 **1**

The smallest part of a disk that can be written to in one operation is

A) a surface
B) a sector
C) a track
D) a cylinder

Answer B

QUESTION 8 **1**

The resolution of a VDU refers to

A) the diagonal distance across the screen
B) the number of colours it can display
C) the number of pixels it can display
D) the rate at which the image is produced

Answer C

QUESTION 9 **1**

Which of these examples of information could be classified as the internal plans of an organisation?

A) sales figures
B) cash flow
C) budgets
D) demand

Answer C

QUESTION 10 **1**

Hiding the complexities of the hardware from the user is the responsibility of

A) the application
B) the drivers
C) the compiler
D) the operating system

Answer D

SECTION A – 2

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

Note: if you give more than the required number of responses you may lose marks!

Marks

QUESTION 11 **3**

The following statements apply to different components of the system bus in a computer. Match the statements **A, B** and **C** to the correct component, **(i), (ii)** and **(iii).**

A – its width determines the maximum memory capacity of the computer system
B – it carries signals from the system clock to coordinate actions
C – its width determines how many times the processor must access main memory to retrieve an instruction

Components:
i) data bus
ii) control bus
(ii) address bus
Answer A) iii), B) ii), C) i)
3 points, 1 mark each

QUESTION 12 **3**

Data can be stored for future use on a variety of media such as

A – a hard disk
B – flash memory (USB disk)
C – DVD.

For each of these media, state whether it is an example of
i) optical storage
ii) magnetic storage
iii) EPROM storage
Answer A) ii), B) iii), C) i)
1 mark each, maximum 3

QUESTION 13 **3**

Three types of information in an organisation can be respectively described as

A – ad hoc and ill structured
B – regular and concerned with the near future
C – repetitive and programmable.

For each of these types of information, match it to the level of management that would make use of it. Choose from **(i), (ii)** and **(iii).**

i) middle management
ii) top management
iii) supervisory management.
Answer A) ii) , B) i), C) iii)
1 mark each maximum 3

Marks

QUESTION 14 **3**

The following are examples of businesses that make use of information:

A – education
B – airlines
C – banks.

Match each of these businesses to the best description of the information processing and the information contained in the product of each business from the list below.

i) process has **high** information content, product has **medium** information content
ii) process has **medium** information content, product has **medium** information content
iii) process has **high** information content, product has **high** information content.

Answer ***A) ii), B) iii), C) i)***
1 mark each maximum 3

QUESTION 15 **3**

Which THREE of the following are specific objectives of a multiprogramming operating system?
A) minimise unused CPU time
B) reduce the incidence of peripheral-bound operations
C) allow data to be batched before it is processed
D) allow the processing of interrupts
E) provide interactivity with the user
F) prevent single programs from dominating the CPU

Answer ***A), B), F)***
1 mark each, maximum 3

QUESTION 16 **3**

The number 6B is an integer expressed in a certain number base. In another number base, the same number is expressed as 107 and in yet another it is 153.

Identify the base number for each of these three numbers, (i) 6B, (ii) 107 and (iii) 153.

Answer
- ***6B – hexadecimal / 16***
- ***107 – denary / decimal / 10***
- ***153 – octal / 8***

1 mark each correct match, maximum 3. Must be a clear identification of the correct number.

QUESTION 17 **3**

Which THREE of the following are coding systems used for storing characters?
A) EBCDIC
B) MP3
C) BMP
D) Unicode
E) ASCII
F) TIFF

Answer ***A), D), E)***
1 mark each maximum 3

Marks

QUESTION 18 **3**

In some file retrieval systems, there is a mathematical relationship between the record number and the disk address at which the record is stored. In this situation, which THREE statements are true?

A) it is random file organisation
B) it can also be used with tape storage
C) it ensures that there are no gaps caused by empty data blocks
D) it requires new records to be positioned at the end of a file
E) it can make use of hashing algorithms to generate the disk address
F) it allows fast access to records

Answer A), E), F)
1 mark each maximum 3

QUESTION 19 **3**

Which THREE of the following might be components of a data packet?

A) source address
B) protocol
C) sequence number
D) checksum
E) route to be taken
F) computer platform

Answer A), C), D)
1 mark each maximum 3

QUESTION 20 **3**

Which THREE of the following are file compression standards?

A) BMP
B) JPEG
C) MPEG
D) MP3
E) MDB
F) WAV

Answer B), C), D)
1 mark each maximum 3

Total 40 Marks

SECTION B
ANSWER ANY THREE QUESTIONS

QUESTION 21 **Marks**

Throughout the question, please credit any valid alternative point.

a) i) Explain what is meant by *layering* with reference to computer networks. **3**

- ***division of network functions***
- ***each layer acts independently of other layers***
- ***each layer can communicate with adjacent layers***

1 mark each, maximum 3

ii) Explain how layering helps in the design and maintenance of networks. **3**

- ***provides common standards***
- ***aids thinking about network components***
- ***aids designing network components***
- ***allows concentration on one layer while ignoring others***

any 3 points, 1 mark each, maximum 3

b) i) Explain the difference between a LAN and a WAN. **6**

LAN

- ***local area network***
- ***restricted to one site***
- ***privately owned***
- ***multi-connection technology***
- ***can connect devices other than computers / example***

any 3 points, 1 mark each, maximum 3

WAN

- ***wide area network***
- ***large geographic area***
- ***point to point links***
- ***may use national telecoms providers***
- ***some nodes are wiring centres / routers***

any 3 points, 1 mark each, maximum 3

Marks

ii) Explain the difference between token ring and Ethernet LAN technologies. **8**

Token Ring

- ***tokens passed***
- ***around circular topology / diagram or description to show continuous circular arrangement***
- ***token may be empty***
- ***or hold a message***
- ***message placed on empty token***
- ***contains address of destination***
- ***data collisions avoided***
- ***good performance***

any 4 points, 1 mark each maximum 4

Ethernet

- ***cable has terminators***
- ***to prevent signal reflection***
- ***may use UTP / co-axial cable***
- ***repeaters for long distances***
- ***conceptually a single cable***
- ***hubs / switches for sharing connections***
- ***devices can transmit at any time***
- ***this can lead to collisions***
- ***collisions slow down traffic***
- ***after collision, devices wait random length of time then re-transmit***

any 4 points, 1 mark each maximum 4

Total 20 Marks

QUESTION 22 **Marks**

Throughout the question, please credit any valid alternative point.

a) i) Describe TWO advantages of using fixed length records in a data file. **4**

- ***file size is predictable***
- ***this allows correct provision to be made for storage***
- ***records found quickly***
- ***because position can be calculated***
- ***necessary for relational databases***

any 4 points, 2 marks each, maximum 4

ii) Describe TWO advantages of using variable length records in a data file. **4**

- ***flexible structure***
- ***number of fields may be varied in different records***
- ***saves storage space***
- ***because records not padded***
- ***simple storage formats***
- ***such as CSV***
- ***many applications can read these formats***

any 2 points, 2 marks each, maximum 4

b) Explain the differences between a master file and a transaction file. Give one example of each type of file. **6**

Master file

- ***always contains data***
- ***contains up-to-date data (on a set of similar entities)***
- ***important reference source for organisation***
- ***ordered in some way (e.g. indexed key field)***

any 2 points, 1 mark each, maximum 2

Transaction file

- ***data about events***
- ***no particular order / chronological order***
- ***used to update master file***

any 2 points, 1 mark each, maximum 2

Examples

- ***correct example of a master file e.g. books in a library, staff in a company, stock in a shop etc.***
- ***correct example of a transaction file e.g. book loans, sales, invoice payments etc.***

any 2 points, 1 mark each, maximum 2

Marks

c) i) State what is meant by a serial file. **1**

- ***records arranged one after another***
- ***added as they come / chronologically***

either point – 1 mark

ii) Explain how a record is added to a sequential file. **2**

- ***(record pointer) moves to end of file***
- ***record written at that point***

1 mark each, maximum 2

iii) Explain how a record is located in an indexed sequential file. **3**

- ***index file and data file exist***
- ***record key looked up in index file***
- ***pointer to data is read from index file***
- ***data accessed directly from data file / correct position found in data file***

any 3 points, 1 mark each, maximum 3

Total 20 Marks

QUESTION 23 **Marks**

Throughout the question, please credit any valid alternative point.

a) i) Describe THREE characteristics of real time operating systems. **3**

- ***support applications that are non-sequential***
- ***have to deal with events that happen in parallel***
- ***have to deal with events that happen at unpredictable times***
- ***have to process and produce a response within a specified time period***
- ***may have to operate in fail-safe mode / often used in safety critical situations***

any 3 points, 1 mark each, maximum 3

ii) Explain why a real-time operating system is necessary in supporting an air traffic control application. **2**

- ***events are happening unpredictably***
- ***safety issues***
- ***responses required immediately***

any 2 points, 1 mark each, maximum 2

b) i) Explain what is meant by a *client-server* operating system. **4**

- ***supports a network / LAN***
- ***which contains at least one server***
- ***and workstations***
- ***applications / data stored on server***
- ***OS handles requests for services from server***
- ***OS handles security / log in activities***

1 mark each point, maximum 4

ii) Explain what is meant by a *distributed system*. **4**

- ***resources exist at separate nodes in a network***
- ***e.g. CPU***
- ***e.g. other device such as output / storage devices / named device***
- ***files can be on different computers***
- ***software can be on different computers***
- ***locations are transparent to user***

1 mark each point, maximum 4

c) i) Explain what is meant by a *process*. **2**

- ***instance of a program***
- ***currently in execution***

1 mark each, maximum 2

ii) A process may be *running*, *runnable* or *suspended*. Explain what is meant by each of these states. **3**

- ***running – using the CPU***
- ***runnable – able to run but temporarily stopped in favour of another process***
- ***suspended – unable to run until some external event occurs***

1 mark each point, maximum 3

iii) In what TWO ways can processes communicate? **2**

- ***shared storage***
- ***message passing***

1 mark each, maximum 2

Total 20 Marks

QUESTION 24 **Marks**

Throughout the question, please credit any valid alternative point.

a) i) With reference to a computer processor, explain what *registers* are. **2**

- ***memory locations / units in the processor***
- ***high speed***
- ***store data read from memory***
- ***may carry out operations on data***

any 2 points, 1 mark each, maximum 2

ii) Explain the roles of the instruction register and the program counter in the fetch-decode-execute cycle. **6**

- ***program counter holds the address of the next instruction to be fetched***
- ***instruction at that address is copied into CPU***
- ***copied into the memory data register***
- ***copied into the instruction register***
- ***value in program counter incremented***
- ***instruction in instruction register is decoded***
- ***instruction is executed***

any 6 points, 1 mark each, maximum 6

b) Distinguish between main memory and processor cache memory. **4**

main memory

- ***RAM***
- ***external to the processor***
- ***stores program instructions***
- ***and data***

any 2 points, 1 mark each, maximum 2

processor cache memory

- ***between processor and main memory***
- ***may be on processor chip***
- ***fast***
- ***checked first before a main memory read***
- ***holds copy of data transferred from main memory***

any 2 points, 1 mark each, maximum 2

Marks

c) i) What is an interrupt? **2**

- ***a signal***
- ***that causes the processor to suspend processing of current program***

2 points, maximum 2

ii) Explain how an interrupt is dealt with by the operating system. **3**

- ***current actions suspended***
- ***registers saved***
- ***return address saved***
- ***control transferred to interrupt servicing routine***
- ***correct routine chosen as a result of code sent***
- ***when interrupt service routine finished, control passed back to original program***
- ***registers restored***
- ***any correct mention of the stack***

any 3 points, 1 mark each, maximum 3

iii) State THREE examples of events that could give rise to the generation of an interrupt. **3**

<u>examples</u>

- ***program: e.g. overflow, division by zero or illegal instruction***
- ***timer: e.g. to allow another process to be run***
- ***i/o: e.g. operation completed (or example) / error condition (or example – e.g. printer out of paper)***
- ***hardware failure: e.g. power failure or memory parity error***

any 3 points, 1 mark each, maximum 3

Total 20 Marks

Specification Grid IDCS CT June 2006

Section A1	Obj A	Obj B	Obj C	Obj D	Obj E	Obj F	Obj G	Obj H	Obj I	Page reference "Computer Technology" (NCC Education Ltd, 2001)
Q1	1									3
Q2	1									5
Q3	1									6
Q4		1								36
Q5		1								37
Q6		1								45
Q7			1							60
Q8			1							78
Q9				1						95
Q10					1					113
total A1	**3**	**3**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**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								49
Q12			3							65
Q13				3						96
Q14				3						98
Q15					3					118
Q16						3				152
Q17						3				154-155
Q18						3				164
Q19							3			200
Q20									3	247
total A2	**0**	**3**	**3**	**6**	**3**	**9**	**3**	**0**	**3**	**30 marks**
total Section A	**3**	**6**	**5**	**7**	**4**	**9**	**3**	**0**	**3**	**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) ii)							6			193 et seq
Q21b) i) ii)							14			201 et seq
Q22a)i) ii)						8				157
Q22b)						6				158
Q22c)i)						1				160
Q22c)ii)						2				161
Q22c)iii)						3				161-2
Q23a)i)					3					121
Q23a)ii)					2					121
Q23b)i)					4					122
Q23b)ii)					4					122
Q23c)i)					2					126
Q23c)ii)					3					126
Q23c)iii)					2					127
Q24a)i)		2								41
Q24a)ii)		6								42
Q24b)		4								47
Q24c)i)		2								49
Q24c)ii)		3								49
Q24c)iii)		3								50
total B		**20**	**0**	**0**	**20**	**20**	**20**	**0**	**0**	

