INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

COMPUTER SCIENCE
STANDARD LEVEL
PAPER 1

Monday 8 May 2000 (afternoon)

1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

• Do not open this examination paper until instructed to do so.
• Answer all of Section A.
• Answer three questions from Section B.

SECTION A

*Answer **all** questions.*

1. An analog to digital converter (A-D converter) transfers data to a computer. After conversion the binary value is 0100111.

   (a) State the equivalent decimal integer value.   *[1 mark]*

   (b) State **one** application that requires an A-D converter.   *[1 mark]*

   (c) Outline the need for an A-D converter.   *[2 marks]*

2. (a) Outline the difference between a serial file and a sequential file.   *[2 marks]*

   (b) State **one** advantage of using a sequential file rather than a serial file.   *[1 mark]*

3. (a) State **one** application that uses on-line processing.   *[1 mark]*

   (b) State **one** application that uses real-time processing.   *[1 mark]*

4. Describe the use of a check digit in the detection of data entry errors.   *[3 marks]*

5. State **two** applications for data compression software.   *[2 marks]*

6. Describe the improvements in performance of a personal computer by:

   (a) increasing the size of RAM.   *[2 marks]*

   (b) increasing the size of cache memory.   *[2 marks]*

7. Outline the need for standard protocols within a network.   *[2 marks]*

8. Outline **two** anti-social or illegal activities which have occurred as a result of the growth of computer technology.   *[4 marks]*

9. Explain **two** advantages of modularity in creating a software solution to a problem.   *[6 marks]*

SECTION B

*Answer **three** questions.*

10. Consider the following algorithm, which processes an input string:

```
procedure DISPLAY(val LIST string)
    declare POSITION integer
    declare ITEM string
    declare CHAR character

    ITEM <-- ""
    POSITION <-- 1
    repeat
        CHAR <-- copy(LIST,POSITION,1)
        if CHAR = "-" then
            output ITEM
            ITEM <-- ""
        else
            concat(ITEM,CHAR)
        endif
        POSITION <-- POSITION + 1
    until POSITION > length(LIST)
    output ITEM
endprocedure DISPLAY
```

Notes: • Each output will display the expression on a new line.
- "" is a null (empty) string.
- Recall that **copy**(S,START,COUNT) extracts a substring from S, for example **copy**("healing",4,2) extracts "li", and that **concat** concatenates (joins) the two parameters, for example **concat**("fat","her") gives "father".

(a) Trace the algorithm for the call DISPLAY("ant-bat-fish") by copying and completing the following table up to the line when POSITION becomes 6.

ITEM	POSITION	CHAR	CHAR = "-"	OUTPUT
""	1	"a"	false	
"a"	2	"n"	false	
⋮	⋮	⋮	⋮	⋮

[4 marks]

(b) Deduce the purpose of this algorithm.   *[3 marks]*

(c) The output is dependent on the precise format of the parameter string. For example, DISPLAY("ant- bat-fish") would not generate the desired output, because of the space before bat.

   (i) Identify **one** further string that would cause another error in the output.   *[1 mark]*

   (ii) Explain how user documentation could help to prevent data entry errors.   *[2 marks]*

11. The diagram below shows the local area networks (LANs) of two offices of an international company. The LANs are connected to a wide area network (WAN) using a modem and a public analog telephone line. The networks are used for email and video-conferencing.

Office 1
LAN

Office 2
LAN

WAN
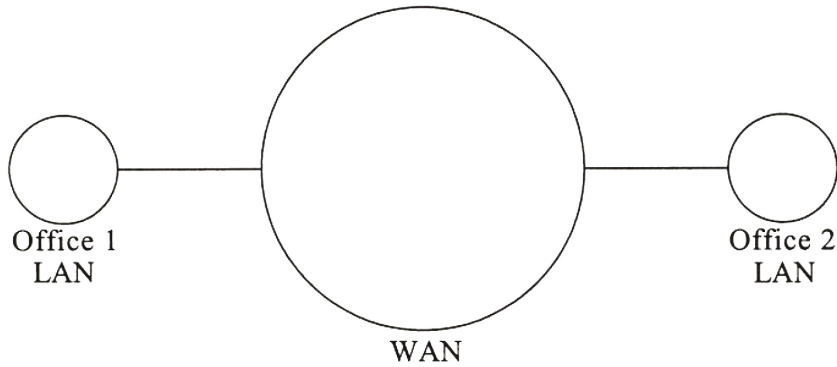
(a)   State **two** other possible communication links that could be used between the LANs and the WAN.   *[2 marks]*

(b)   State **two** resources that could be shared on a LAN.   *[2 marks]*

(c)   Compare the use of email with video-conferencing for communication between the offices.   *[6 marks]*

12. A software system can be supplied to a customer with either the source code or the executable (object) code.

(a) Outline the difference between the two kinds of code. *[2 marks]*

(b) State **one** advantage and **one** disadvantage to the customer of only having the executable (object) code. *[2 marks]*

(c) Discuss the role of an editor **and** a debugging tool in the translation from the source code to the executable code. *[4 marks]*

(d) Describe **one** situation in which a source code is generated by software, rather than being written directly by a programmer. *[2 marks]*

13. A doctor who is treating a patient sends medical data to a local hospital. The data includes an identity number, name, various readings such as heart rate and blood pressure, and notes made by the doctor. The data is sent using a telecommunications link.

    (a)   (i)   State what is meant by maintaining the integrity of the data. *[1 mark]*

          (ii)   Outline **one** method of trying to maintain the integrity of the data being sent over the telecommunications link. *[2 mark]*

    (b)   (i)   State what is meant by maintaining the security of the data. *[1 mark]*

          (ii)   Outline **one** method of trying to maintain the security of the data being sent over the telecommunications link. *[2 marks]*

    (c)   Discuss the implications of a systems failure in this situation, identifying **two** possible components where failure could occur. *[4 marks]*