

# The West Midlands Examinations Board

Certificate of Secondary Education

COMPUTER STUDIES

PAPER II

Thursday, 17th May, 1984

1.30 – 3.30 pm

Stationery: One 8 page answer book (green) Form 352

One 4 page answer book (blue) Form 351 (if required)

- 1 Answer FIVE questions ONLY.
- 2 Read and follow the instructions given on the answer book.

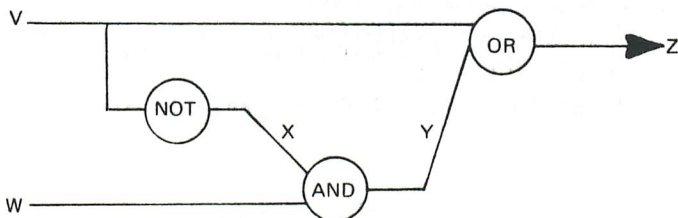
[Turn over

- 1
  - (a) Why is a barrel printer or a chain printer called a line printer?
  - (b) Which device outputs faster: a line printer or a teletypewriter?
  - (c)
    - (i) Where are the metal type characters to be found in a line printer?
    - (ii) How many letter A's are there in this line printer?
  - (d) How many hammers are there in a line printer?
  - (e) What are the hammers used for in a line printer?
  - (f) Describe what happens to the metal type, the paper being printed, the inked ribbon, and the hammer at the instant when a character is being printed.
  - (g)
    - (i) What is pre-printed continuous stationery?
    - (ii) Name **one** application where it is used.
    - (iii) Which computer personnel would load it into the printer?
  - (h) Some computer installations do not always use printers on-line. Instead they write the output onto magnetic tape and print it out off-line later. Give **two** reasons why they might do this.
  
- 2
 

A firm which deals in second-hand cars intends to set up an information retrieval system using a microcomputer. The system will be used by the firm so that it can give quick answers to customers' questions about the cars in stock.

  - (a) The firm wants to be able to check its files to find if it has for example  
 A blue Ford Anglia in good condition not more than twenty years old and costing about £500.00.  
  
 Name **six** fields which would be found in each record of the file.
  - (b) If the firm also wanted to know how much profit it had made when it sold a car and how long the car had been in stock, what additional information would be held in each record?
  - (c) Most customers, when they want to buy a car, know exactly what model and make of car they are looking for. What would be the best keys on which to order the records when the file is created?
  - (d) If cassette tapes were the only backing storage available, why would more than one cassette drive be needed?
  - (e) If floppy discs were available, only one disc drive would be needed. If two disc drives were used, how would the security of the files be improved?
  - (f)
    - (i) Which type of backing store would be best for this application?
    - (ii) Give **one** reason for your choice.
  - (g) Describe what would need to be done to amend the files when
    - (i) a car is sold by the firm,
    - (ii) a car is bought by the firm.

- (e) Make a truth table for the following circuit.



- (f) What would happen if the NOT gate developed a fault and always gave an output of 1?
- (g) Draw a logic circuit which behaves in the same way as the given circuit but uses only one gate.
- 6 (a) Explain what is meant by each of the following kinds of error and say how each of them can occur.
- A compilation error.
  - A run time error.
  - A logic error.
  - A syntax error.
  - A data error.
  - A rounding error.
- (b) What is the purpose of a debugging aid, sometimes also called a diagnostic aid?
- (c) Give an example of a debugging aid and describe what it does.
- 7 (a) Where in a supermarket would you find a point-of-sale device, sometimes called a P-O-S device?
- (b) Other than a keyboard, what kind of input device might it use?
- (c) What sort of information is read by this input device?
- (d) How is this information represented?
- (e) List three things that the point-of-sale device prints out for the customer.
- (f) What additional information does the point-of-sale device give specially to help the person who operates it?
- (g) How does the point-of-sale device help to maintain the correct level of stocks?
- (h) Describe briefly how the stock control system would work.

- 8 Whenever a customer buys goods from a certain warehouse, the sale is recorded in the SALES-FILE and at the end of every day the information is transferred to a file which records, for each customer, the total value of goods which he has bought from the warehouse during the current month.

In the DATA DIVISION of the COBOL program which processes these files, a record in the CUSTOMER-FILE is called CUSTOMER-RECORD, and a record in the CUST-FILE is called CUST-RECORD.

The PROCEDURE DIVISION of the program is as follows:

OPEN-THE-FILES.

OPEN INPUT SALES-FILE CUSTOMER-FILE.  
OPEN OUTPUT CUST-FILE.

READ-SALES-FILE.

READ SALES-FILE AT END GO TO CLOSE-THE-FILES.

READ-CUSTOMER-FILE.

READ CUSTOMER-FILE AT END GO TO CLOSE-THE-FILES.  
IF ACCOUNT-NUMBER IN SALES-FILE IS NOT EQUAL TO  
ACCOUNT-NUMBER IN CUSTOMER-FILE GO TO COPY-THE-RECORD.  
ADD SALES IN SALES-FILE TO SALES IN CUSTOMER-FILE.  
MOVE CUSTOMER-RECORD TO CUST-RECORD.  
WRITE CUST-RECORD.  
GO TO READ-SALES-FILE.

COPY-THE-RECORD.

MOVE CUSTOMER-RECORD TO CUST-RECORD.  
WRITE CUST-RECORD.  
GO TO READ-CUSTOMER-FILE.

CLOSE-THE-FILES.

CLOSE SALES-FILE CUSTOMER-FILE CUST-FILE.  
STOP RUN.

- (a) Name two input files which are used by the program.
- (b) Name two fields which are to be found in both input files.
- (c) Which file is updated?
- (d) What is the new file called?
- (e) What will the newly updated file be called next time this program is run?
- (f) When does a record not need to be updated?
- (g) The program assumes that the SALES-FILE and the CUSTOMER-FILE have been sorted. On what key is it assumed they have been sorted?
- (h) What would happen if the SALES-FILE had not been sorted?
- (i) What assumption is made in the program about the number of entries in the SALES-FILE for each customer?

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Certificate of Secondary Education

COMPUTER STUDIES

PAPER II

Tuesday, 12th May, 1981

1.30 — 3.30 pm

Stationery: One 8 page answer book (green) Form 352  
One 4 page answer book (blue) Form 351 (if required)

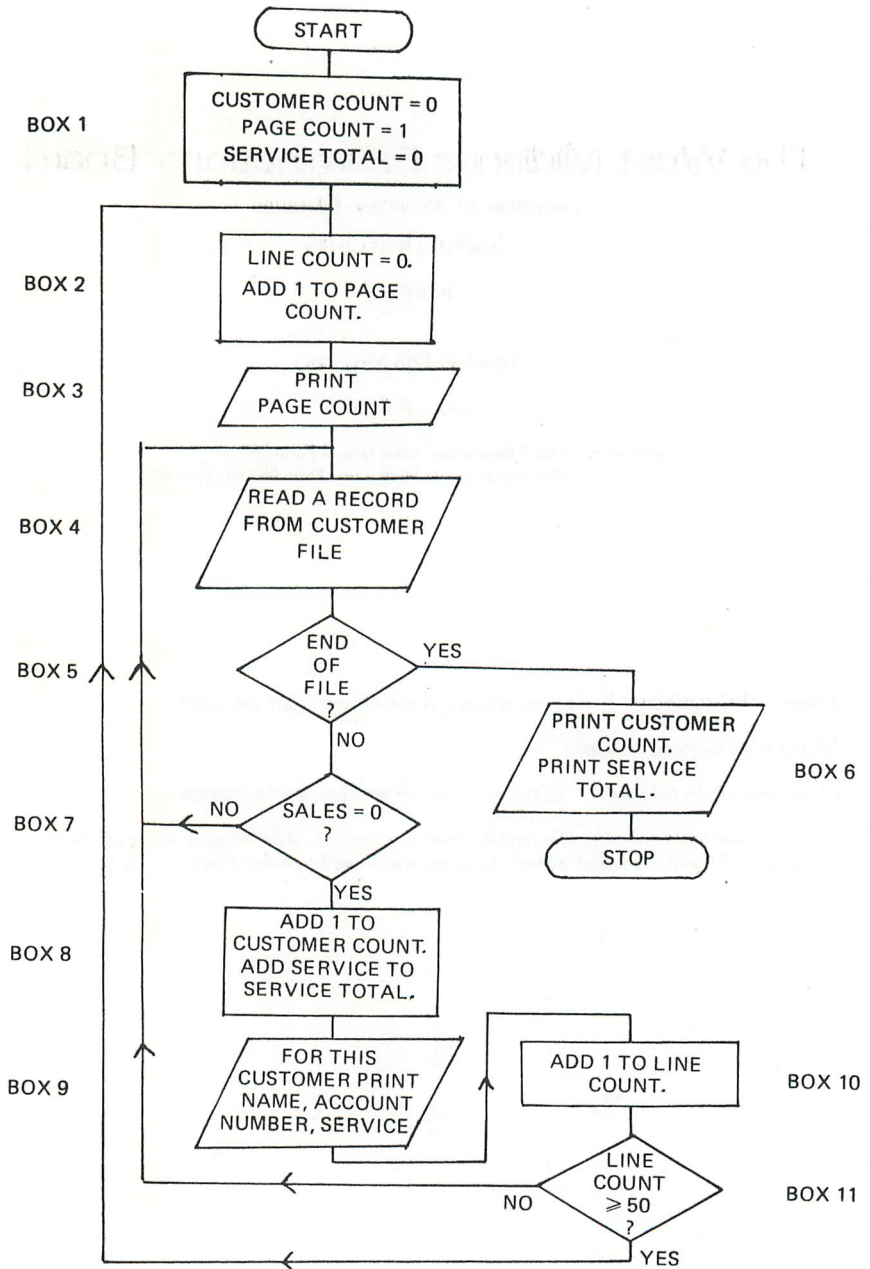
*Answer FIVE questions. Write your answers in the Answer Book provided.*

*All questions carry equal marks.*

*40 per cent of the total marks for the examination are awarded for this paper.*

*Do not answer more than the required number of questions. Additional answers will not be marked. All answers which are not to be marked must be clearly crossed through.*

[Turn over



Answer FIVE questions.

- 1 A firm which sells and services washing machines wants to know how much is spent by customers who pay for machines to be serviced but do not buy anything from the firm. The firm maintains a card file. For each customer, the file has a card which contains:
- customer's name,
  - customer's account number,
  - customer's sales account giving the total value of purchases,
  - customer's service account giving the total he has spent on servicing.

The flowchart opposite illustrates a program to print details from this file. Read the flowchart and then answer the following questions. Notice that the flowchart boxes have been numbered.

- (a) The page number is printed at the top of each page by the instruction in BOX 3. What is printed at the top of the first page?
  - (b) Without changing BOX 2, how could you alter the flowchart so that the number 1 is printed at the top of the first page?
  - (c) Excluding the page number, how many lines are there in a full page of output?
  - (d) When the last card has been processed, what does the value of CUSTOMER COUNT represent?
  - (e) How would you alter the flowchart so that the total number of customers is printed out after the last card has been read?
  - (f) How would you alter the flowchart so that the average amount spent by all customers on servicing is printed out after the last card has been read?
- 2 (a) Draw a diagram to illustrate how information is set out on a magnetic tape. The diagram should show:

blocks,  
inter-block gaps,  
bits,  
characters,  
fields,  
records.

- (b) What is the purpose of the inter-block gap?
- (c) Why is it preferable to write long blocks on the tape?
- (d) Why is it not sensible to store randomly ordered information on a magnetic tape?
- (e) Give TWO reasons why it is better to store information on magnetic tape rather than on punched cards.
- (f) Give TWO reasons why it is better to store information on punched cards rather than on magnetic tape.
- (g) Data is read from magnetic tape, processed by the computer and then output to the printer. Choose from the following list those units which the data passes through, and write them down in the order that they are visited.

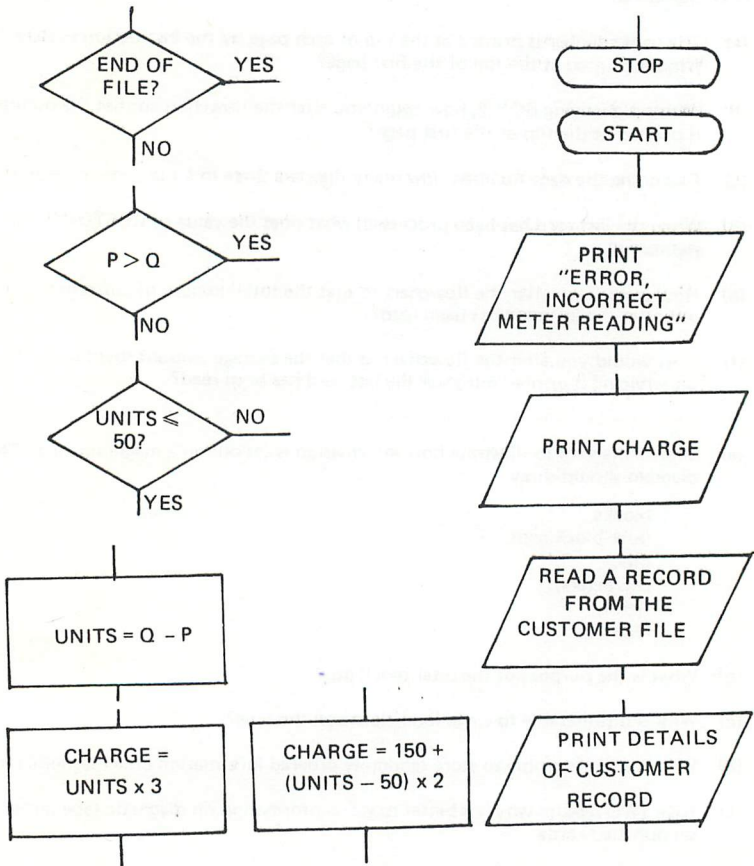
Main control,      Main store,      An input buffer,      An output buffer,  
Arithmetic unit,      Magnetic tape unit,      Line printer.

[Turn over

- 3 Rearrange the boxes and draw in connecting lines with arrows to form a flowchart which describes how to process an electricity bill according to the following rules.

Read the records in turn from the customer file and find how many units each customer has used by subtracting the previous meter reading P from the present meter reading Q. Check to find out whether the meter readings are sensible. If the readings are sensible, print the details from the customer record and print the charge. If they are not sensible, print the details from the customer record and print an error message.

The charge is 3.00 p per unit for the first 50 units and 2.00 p per unit for extra units after the first 50.



- 4 (a) Why is it sometimes necessary to represent numbers in floating point form inside a computer?

- (b) In one system of representing floating point numbers in 12-bit cells, each number consists of a 4-bit exponent and an 8-bit mantissa.

For example 

0	0	1	0
---	---	---	---

0	0	0	0	1	1	1	1
---	---	---	---	---	---	---	---

  
represents  $.00001111 \times 2^2$

Negative values of the exponent or the mantissa are represented in two's complement form.

For example 

1	1	1	0
---	---	---	---

0	0	0	0	1	1	1	1
---	---	---	---	---	---	---	---

  
represents  $.00001111 \times 2^{-2}$

Draw diagrams to represent each of the following:

- (i) the largest positive number which can be written in this system;
  - (ii) the smallest number greater than zero which can be written in this system;
  - (iii) the negative number furthest from zero which can be written in this system.
- (c) The exponent of a floating point number can be increased by 1, without changing the value of the number, if the mantissa is shifted right one place.  
If the following two numbers have the same value, what is the mantissa of the second number?

0	0	1	1
0	1	0	1

0	0	0	1	1	0	0	0
?	?	?	?	?	?	?	?

- (d) Before numbers expressed in floating point form can be added together, their exponents must be equal. The mantissa values are then added and the result has the same exponent as the original numbers.

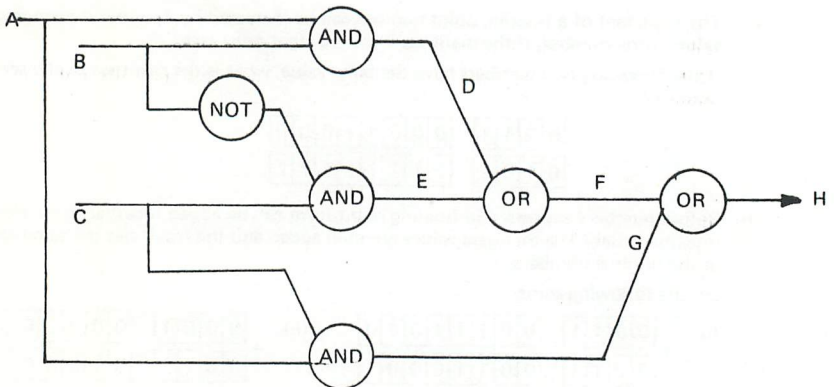
Do the following sums:

$$\begin{array}{r}
 \text{(i)} \quad \begin{array}{|c|c|c|c|} \hline 0 & 0 & 1 & 1 \\ \hline \end{array} \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 1 & 1 & 1 & 0 & 1 & 0 \\ \hline \end{array} \\
 + \quad \begin{array}{|c|c|c|c|} \hline 0 & 0 & 1 & 1 \\ \hline \end{array} \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 \\ \hline \end{array} \\
 \hline
 \end{array}
 \quad \text{(ii)} \quad \begin{array}{r}
 \begin{array}{|c|c|c|c|} \hline 0 & 0 & 0 & 1 \\ \hline \end{array} \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ \hline \end{array} \\
 + \quad \begin{array}{|c|c|c|c|} \hline 0 & 0 & 1 & 1 \\ \hline \end{array} \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 \\ \hline \end{array} \\
 \hline
 \end{array}$$

- (e) What can you say about the accuracy of the answer to (d)(ii)?
- (f) Why is it preferable to increase the value of the smaller exponent rather than decrease the value of the larger exponent when adding two numbers in floating point form?

- 5 (a) Copy this truth table into your answer book and complete the first part of it to show the action of the following circuit.

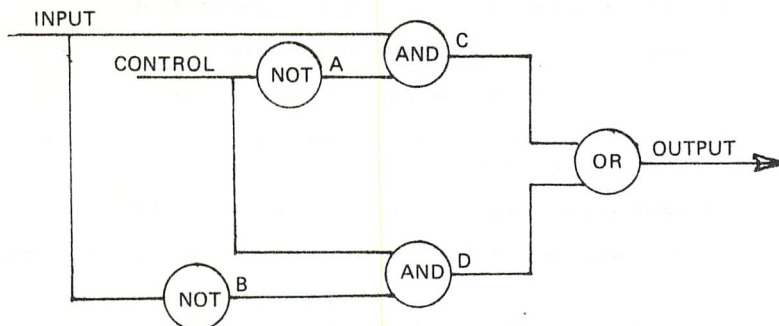
A	B	C	D	E	F	GOOD CIRCUIT		FAULTY CIRCUIT	
						G	H	G	H
0	0	0							
0	0	1							
0	1	0							
0	1	1							
1	0	0							
1	0	1							
1	1	0							
1	1	1							



- (b) Now suppose that the AND gate which has inputs from A and C develops a fault so that G is always 0. Complete the second part of the truth table for this faulty circuit.
- (c) What do you notice about the outputs from the two circuits? What effect does the faulty gate have?
- (d) Draw a logic circuit that behaves in the same way as the given circuit but uses only four gates.

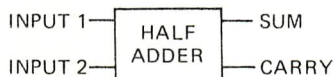
[Question continued on next page

- 3 (a) Copy the given truth table into your answer book and complete it to show the output from the following circuit.



CONTROL	INPUT	A	B	C	D	OUTPUT
0	0					
0	1					
1	0					
1	1					

- (b) (i) What do you notice about INPUT and OUTPUT when CONTROL = 0?  
 (ii) What do you notice about INPUT and OUTPUT when CONTROL = 1?  
 (iii) What value would CONTROL have to be so that the circuit acts like a NOT gate to INPUT?
- (c) Now copy the truth table for a half adder into your answer book and complete it.



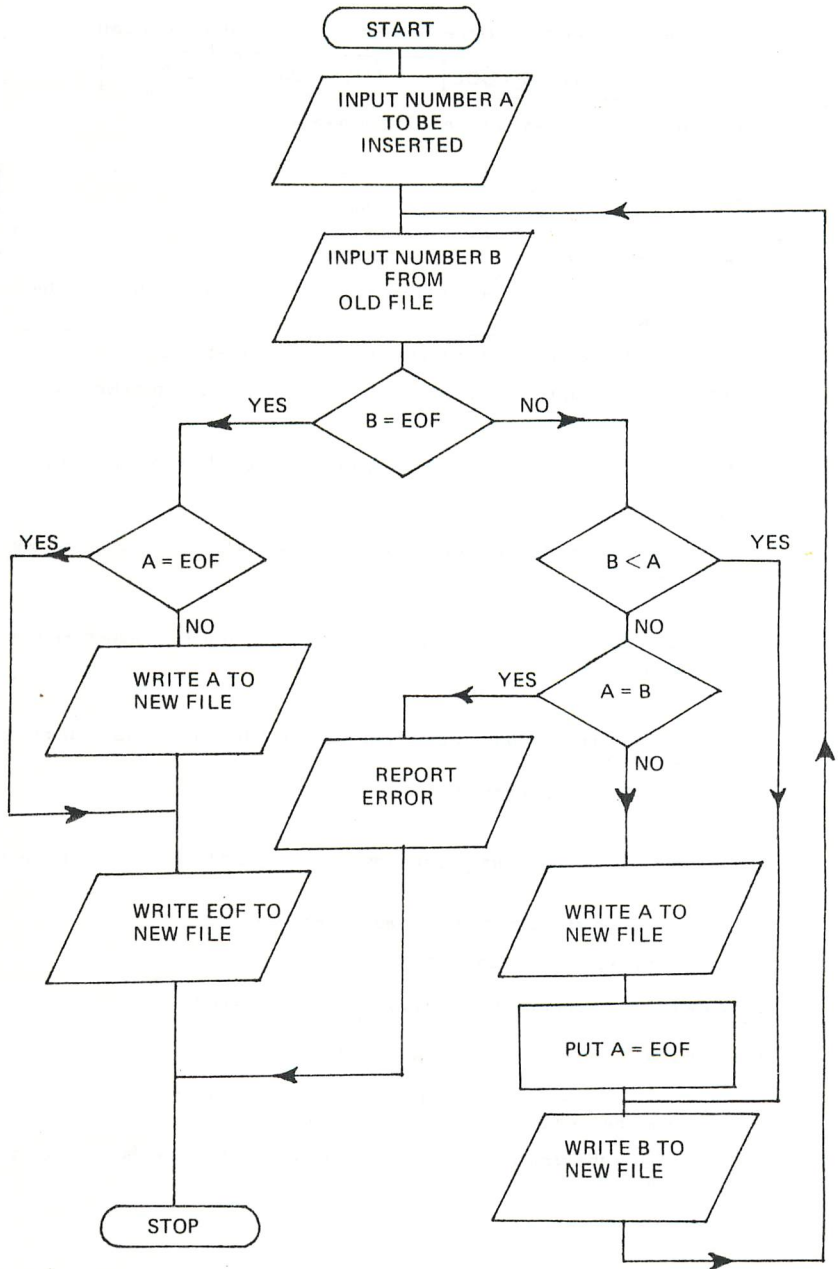
INPUT 1	INPUT 2	SUM	CARRY
0	0		
0	1		
1	0		
1	1		

- (d) What do you notice about OUTPUT in the first truth table and SUM in the second truth table?
- (e) The above half adder can be made to act as a NOT gate.  
 Show how this can be done by answering the following three parts. Use your answers to (a), (b), (c) and (d) to help you.
- (i) What would be connected to INPUT 1 of the half adder?  
 (ii) What would be connected to INPUT 2 of the half adder?  
 (iii) On which of the half adder terminals would OUTPUT be found?
- (f) Explain how you could make the circuit in (a) into a half adder.

4

The flowchart shown on the opposite page describes how to insert a number into an old file to form a new file. At the end of the old file there is a special number called EOF. Read the flowchart and then answer the following questions about it.

- (a) How many decision boxes are there in the flowchart?
- (b) What happens if the number A is equal to the number B?
- (c) When the number to be inserted is bigger than any of the numbers on the old file, where is it put on the new file?
- (d) What can you say about the order of the numbers on the file?
- (e) The special number EOF at the end of the file has to be chosen very carefully. Why?
- (f) After the program has been run, how can you tell just by reading what is at the end of the new file whether or not an error has been found?
- (g) Describe why the program would sometimes lead to failure if, during program input, the line corresponding to flowchart box PUT A = EOF was accidentally left out.
- (h) What can you say about the new file and the old file when the number to be inserted is equal to EOF?



- 5 Machine code instructions for a certain computer occupy eight bits as shown.

OPERATION CODE	LOCATION ADDRESS
----------------	------------------

Some of the operation codes have the following meanings.

Operation Code	Meaning
001	Put the contents of the given location into the accumulator
010	Put the 2's complement of the contents of the given location into the accumulator
011	Add the contents of the given location into the accumulator
100	If the contents of the accumulator is negative jump to the given location

- (a) Write down the operation code of the instruction which is used to make decisions.

- (b) If store location 01100 contains 00000100

- (i) what value is left in the accumulator after the following instruction has been obeyed?

00101100

- (ii) what value is left in the accumulator after the following instruction has been obeyed?

01001100

- (c) What value will be left in the accumulator after the following two instructions have been obeyed?

01000101

01100101

- (d) In this computer characters are stored as eight binary digits. Show how the number 33 might be stored

- (i) if it was part of a man's address *eg* 33 Victoria Avenue.

- (ii) if it was part of a scientific calculation.

- (e) Give **two** disadvantages of writing programs in machine code.

- (f) Give **one** advantage of writing programs in machine code.

- (g) (i) What name is given to programming languages which are at a higher level than machine code but are not high level languages?

- (ii) What is the name of the software which is used to translate these languages into machine code?

- 6 In one system of representing floating point numbers in 12-bit cells, each number consists of a 4-bit exponent and an 8-bit mantissa.

The 4-bit exponent consists of a sign-bit and three binary digits for the value.

For example 

0	010
---	-----

 represents an exponent of +2

and 

1	010
---	-----

 represents an exponent of -2

- (a) What exponents are represented by each of the following?

(i) 

0	100
---	-----

(ii) 

1	101
---	-----

Positive values of the mantissa are represented in 8-bit binary. Negative values of the mantissa are represented in two's complement form.

For example 

1	101
---	-----

00001100
----------

 represents  $12 \times 2^{-5}$

- (b) What number is represented by each of the following?

(i) 

0	011
---	-----

00000110
----------

(ii) 

1	100
---	-----

00001001
----------

The exponent of a floating point number can often be decreased by 1 without changing the value of the number if the mantissa is shifted left one place.

- (c) If the following pairs of numbers have the same value, what is the mantissa of the second number?

(i) 

0	011
---	-----

00010100
----------

0	001
---	-----

????????
----------

(ii) 

1	011
---	-----

00001100
----------

1	101
---	-----

????????
----------

- (d) If the following pairs of numbers have the same value, what is the exponent of the second number?

(i) 

0	011
---	-----

00111000
----------

?	???
---	-----

11100000
----------

(ii) 

1	011
---	-----

00111000
----------

?	???
---	-----

01110000
----------

In this system a number is said to be normalised if the most significant digit of its mantissa is a 1.

For example 

0	010
---	-----

11000000
----------

 is normalised.

but 

0	010
---	-----

01100000
----------

 is not normalised.

- (e) Normalise the following numbers.

(i) 

0	110
---	-----

01010101
----------

(ii) 

1	011
---	-----

00010100
----------

- (f) Why is it not possible to normalise the following number?

1	111
---	-----

01000000
----------

- 7 When a person stops working for a company his record has to be deleted from the company's master pay file. His employee number is punched onto a card and at the end of the week the cards for all the people who have left during that week are sorted into employee number order. The sorted card file which is called the DELETIONS-FILE is used to update the master pay file which is held on magnetic tape.

The PROCEDURE DIVISION of the COBOL program which updates the master pay file is as follows.

OPEN-THE-FILES.

OPEN INPUT DELETIONS-FILE OLD-PAY-FILE.

OPEN OUTPUT NEW-PAY-FILE PRINT-FILE.

READ-DELETIONS-FILE.

READ DELETIONS-FILE AT END GO TO COPY-THE-FILES.

READ-MASTER-FILE.

READ OLD-PAY-FILE AT END GO TO REPORT-ERROR.

IF EMPLOYEE-NUMBER IN DELETIONS-FILE IS EQUAL TO

EMPLOYEE-NUMBER IN OLD-PAY-FILE GO TO READ-DELETIONS-FILE.

COPY-THE-RECORD.

MOVE EMPLOYEE-RECORD IN OLD-PAY-FILE TO EMPLOYEE-RECORD IN  
NEW-PAY-FILE.

WRITE EMPLOYEE-RECORD IN NEW-PAY-FILE.

GO TO READ-MASTER-FILE.

REPORT-ERROR.

MOVE ERROR-MESSAGE TO PRINT-LINE.

WRITE PRINT-LINE AFTER ADVANCING 2 LINES.

GO TO CLOSE-THE-FILES.

COPY-THE-FILES.

READ OLD-PAY-FILE AT END GO TO CLOSE-THE-FILES.

MOVE EMPLOYEE-RECORD IN OLD-PAY-FILE TO EMPLOYEE-RECORD IN  
NEW-PAY-FILE.

WRITE EMPLOYEE-RECORD IN NEW-PAY-FILE.

GO TO COPY-THE-FILES.

CLOSE-THE-FILES.

CLOSE DELETIONS-FILE OLD-PAY-FILE NEW-PAY-FILE PRINT-FILE.

STOP RUN.

[Question continued on next page]

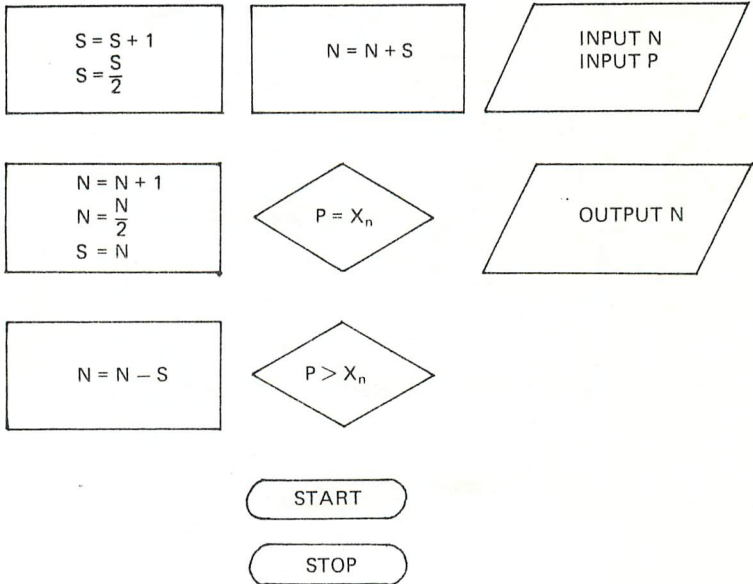
- (a) Name **two** files which are used by the program for input.
- (b) How many output files are used?
- (c) Which file is updated by the program?
- (d) What is the new file called in the program?
- (e) What will the newly updated file be called next time this program is run?
- (f) Which keys are compared in the third paragraph?
- (g) Explain in your own words what happens after the program reaches the end of the deletions file in the second paragraph?
- (h) Write down a meaningful error message which might be printed out if the end of the OLD-PAY-FILE is reached in the third paragraph.
- (i) Explain in your own words what happens in the program after the error message has been printed.

[Turn over

- 8 When it is finished the outline flowchart shown on the opposite page will describe an algorithm to do a binary search of the numbers in cells  $X_1, X_2, X_3, \dots, X_n$  to find which one contains the number  $P$ . The numbers have been sorted into order with the smallest number in  $X_1$ . The algorithm uses integer division which means that whenever a division sum is carried out any remainder in the answer is ignored. For example when integer division is used

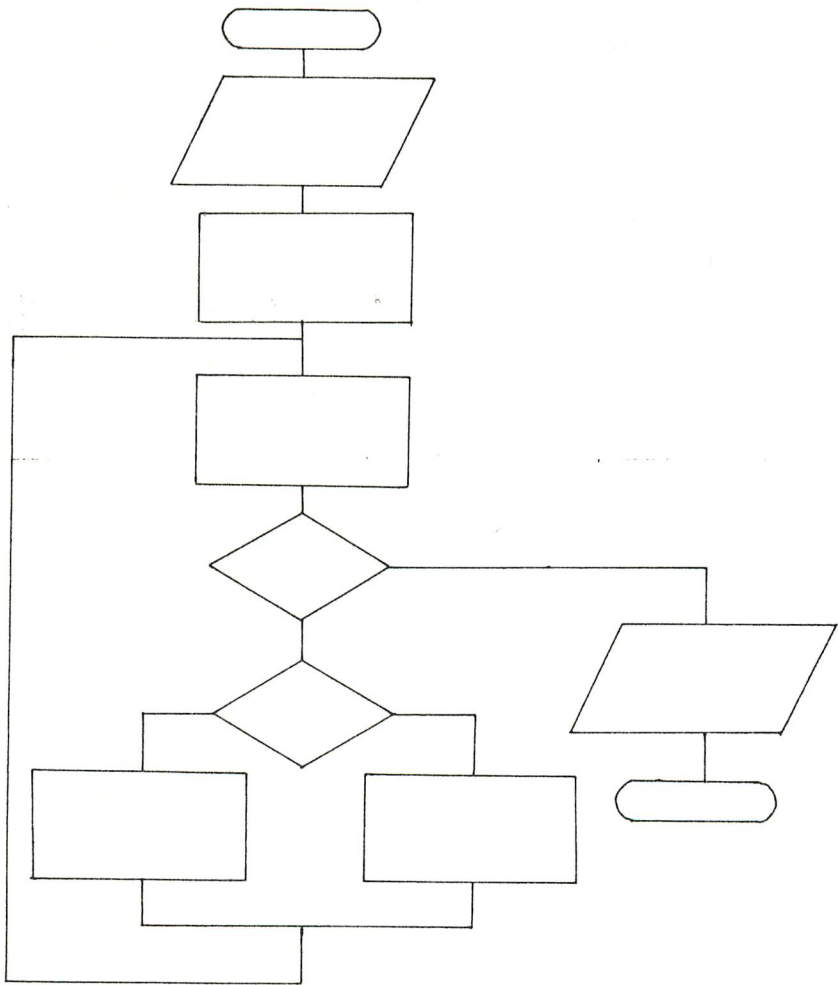
$$\frac{3}{2} = 1, \frac{4}{2} = 2, \frac{5}{2} = 2$$

Complete the flowchart opposite by using the following boxes to replace the empty ones. Be sure to write YES and NO on the exits from the decision boxes and to show any necessary arrows. Remember to write your candidate number at the top of the page, detach the page and fasten it to your answer book.



To be used to answer Question 8

--	--	--	--	--	--	--	--



IF YOU HAVE ANSWERED THIS QUESTION, REMEMBER TO TEAR OUT THIS PAGE  
AND ATTACH IT TO YOUR ANSWER BOOK.

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- 1 (a) Choose from the following kinds of store the answer to each of parts (i) – (viii).

Immediate access. Sequential access. Read only. Backing.

What kind of store:-

- (i) is a floppy disc?
  - (ii) stores results and is part of the CPU?
  - (iii) has the longest access time?
  - (iv) might suffer a head crash?
  - (v) is permanently written by the manufacturer?
  - (vi) cannot be erased by the programmer?
  - (vii) could be volatile?
  - (viii) could be a dynamic RAM?
- (b) (i) In computing, what is meant by a table (sometimes called a two dimensional array)?
- (ii) Give an example to show why a programmer might want to store a table in immediate access store.
  - (iii) Explain how the programmer could access an entry in the table directly.
  - (iv) Explain how the programmer could search the table sequentially.
- 2 (a) Explain what is meant by each of the following kinds of error and say how each of them can be avoided.
- (i) A run time error.
  - (ii) A logic error.
  - (iii) A data error.
- (b) Give an example of a debugging aid and explain what it does.
- (c) (i) The following character should have odd parity but one of its bits has been lost. What is the value of the missing bit?
- 0 1 1 0 1 1 0
- (ii) What might have happened if the parity of a character is correct but the character is wrong?
- (d) (i) Where might you find a check sum?
- (ii) For what is a check sum used?
- (e) (i) Give one reason why sequence errors are more likely to occur on punched cards than on paper tape.
- (ii) Give one reason why a programmer might more easily find the punching errors on punched cards than the punching errors on paper tape.
  - (iii) Give one reason why it is easier to correct errors on punched cards than on paper tape.

- 3 (a) (i) What is an assembly language?  
 (ii) What is an assembler?  
 (iii) State **two** tasks of an assembler.
- (b) In one assembly language the following instructions have the meanings given.
- |        |    |   |
|--------|----|---|
| LOAD   | 42 | means copy the contents of store 42 into the accumulator. |
| LOAD N | 42 | means place the <b>number</b> 42 into the accumulator.    |
| ADD    | 42 | means add the contents of store 42 into the accumulator.  |
| ADD N  | 42 | means add the <b>number</b> 42 into the accumulator.      |
- (i) If store location 20 contains the value 4, what value will be left in the accumulator after the following instructions have been obeyed?
- |        |    |
|--------|----|
| LOAD N | 20 |
| ADD    | 20 |
- (ii) If store location 30 contains the number 3 and has the symbolic address TOTAL, what value will be left in the accumulator after the following instructions have been obeyed?
- |      |       |
|------|-------|
| LOAD | TOTAL |
| ADD  | TOTAL |
- (iii) What mistake do you think that the programmer has made in the following sequence of instructions?
- |        |      |
|--------|------|
| LOAD   | 42   |
| ADD    | N 42 |
| LOAD N | 42   |
- (iv) Why would the instruction LOAD N 42 take less time to obey than the instruction LOAD 42?

4 Draw diagrams to show how:-

- (a) the following are set out on a magnetic tape:-  
 bits, characters, fields, records, blocks, inter block gaps.
- (b) a 16-bit computer word can store an instruction in machine code. Label the parts of the instruction.
- (c) the number +9 is stored in an 8-bit computer word as an integer (a whole number).
- (d) the number -9 is stored in an 8-bit computer word in one's complement form.
- (e) the number -9 is stored in an 8-bit computer word in two's complement form.
- (f) the hexadecimal number A3 could be stored in an 8-bit computer word.
- (g) the octal number 57 could be stored in a six-bit computer word.
- (h) the graphics character:-



could be stored in an 8-bit computer word.

\* 5 A school has fewer than 10 000 pupils. Each class is known by its year number followed by a single letter, eg 2C, 7A.

- (a) The school keeps a NAME file for all the pupils in the school. For each child it contains:-

name, reference number, class, sex.

Each field has a fixed length.

- (i) Draw a diagram to show what a record for David Smith in class 5A might look like in the NAME file. State the number of characters each field should contain.
  - (ii) Describe two ways of checking the reference number when the file is read into the computer.
- (b) In the third year all the pupils choose the six optional subjects they want to study during the next two years. They choose from the following groups.

Group 1	Group 2	Group 3	Group 4
Needlecraft	Computer Studies	French	Computer Studies
Woodwork	Metalwork	Biology	Science
Chemistry	Music	Shorthand	Physics
Art	Social Studies	Social Studies	Commerce
History	Geography	Geography	History

From each group they have to choose one subject they would most like to study. They must also choose two extra subjects, each from a different group.

Pupil choices are stored in a file called CHOICES. Each record in this file has a pupil reference number and coded information about which subjects were chosen from each group and which of them were the extra subjects.

- (i) Why do student names not have to be included in the CHOICES file?
  - (ii) Why would the information about the choices be coded in the records of the CHOICES file?
  - (iii) Draw a diagram to show what David Smith's record might look like in the CHOICES file.
  - (iv) Explain how the NAMES file and the CHOICES file could be processed by the computer to print a list for each class showing the names of the pupils in the class and, in coded form, the options they have chosen.
- (c) There is a third file. When this file is used in the processing, the choices are printed in full and not in coded form. What information must this third file contain?

6 Copy this truth table into your answer book and then complete it by answering the following questions

X	Y	D	E	B	F	S	C
0	0						
0	1						
1	0						
1	1						

- (a) Use the following rules to fill in columns D and B:-

Rule 1: if X and Y are the same then D equals 0

Rule 2: if X and Y are not the same then D equals 1

Rule 3: B is either 0 or 1 and cannot have any other value

Rule 4: B is always 0 unless D and Y are both equal to 1

- (b) What kind of logic gate would you use to make B from D and Y?

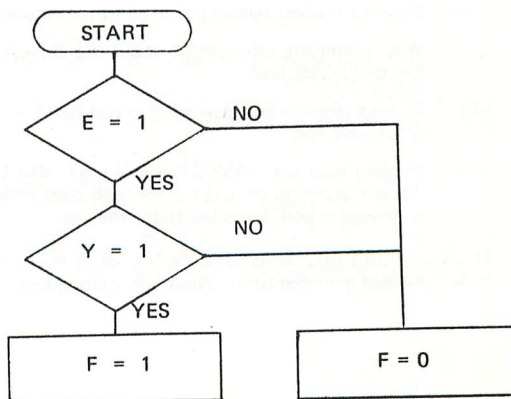
- (c) Here are two more rules, use them to fill in column E.

Rule 5: if D is 1 then E equals 0

Rule 6: if D is 0 then E equals 1

- (d) What kind of logic gate would you use to change D into E?

- (e) Use the flowchart to fill in column F.



[Question continued on next page]

## 6 (Continued)

- (f) S is the Sum output and C is the Carry output from a half adder whose inputs are X and Y.



Fill in columns S and C.

- (g) Look at columns D and S. What do you notice?  
 (h) Look at columns F and C. What do you notice?  
 (i) The circuit which obeys rules 1, 2, 3 and 4 is called a half subtractor.



Copy the half subtractor into your answer book and then obey the following instructions to change it into a half adder.

Add on a logic gate which will change D into E.

Add on another logic gate to make F from E and Y.

\* 7 When goods are bought from a certain warehouse, a card is punched with the following information:-

The customer's account number.

The value of the goods bought by the customer.

These cards are part of the SALES FILE. At the end of each day this SALES FILE is sorted and used to update a magnetic tape file called the CUSTOMER FILE. This file records, for each customer, the total value of the goods bought.

Part of the PROCEDURE division of the COBOL program which updates the CUSTOMER FILE is given opposite. Read the program and then copy the unfinished flowchart into your answer book and fill in the empty box and draw in connecting lines with arrows to describe what the program does.

READ-CUSTOMER-FILE.

READ OLD-CUSTOMER-FILE AT END GO TO CLOSE-THE-FILES.

READ-SALES-FILE.

READ SALES-FILE AT END GO TO CLOSE-THE-FILES.

CHECK-ACCOUNT-NUMBER.

IF ACCOUNT-NUMBER IN SALES-FILE IS EQUAL TO

ACCOUNT-NUMBER IN OLD-CUSTOMER-FILE GO TO AMEND-THE-RECORD.

WRITE-NEW-CUSTOMER-FILE.

MOVE CUSTOMER-RECORD IN OLD-CUSTOMER-FILE TO

CUSTOMER-RECORD IN NEW-CUSTOMER-FILE.

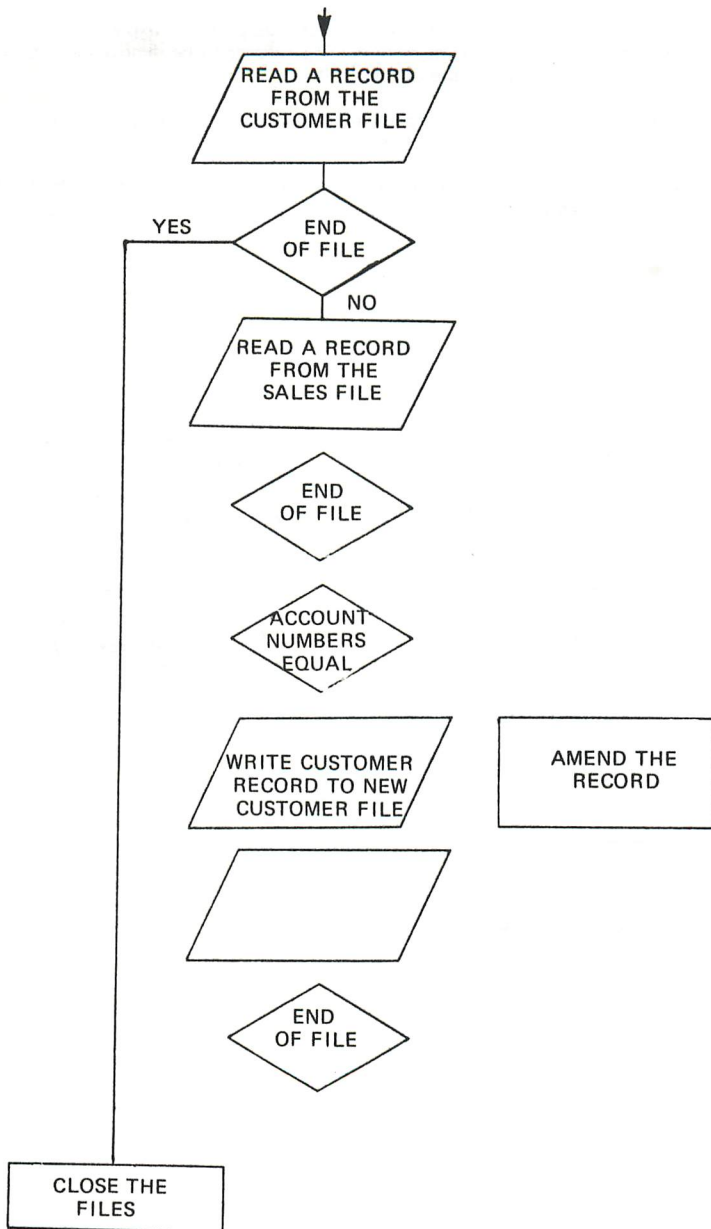
READ OLD-CUSTOMER-FILE AT END GO TO CLOSE-THE-FILES.

GO TO CHECK-ACCOUNT-NUMBER.

AMEND-THE-RECORD.

ADD SALES IN SALES-FILE TO SALES IN OLD-CUSTOMER-FILE.

GO TO READ-SALES-FILE.



- 8 When it is finished the flowchart shown on the opposite page will explain how to update a master file by removing some of its records. The records to be removed are those whose numbers are held on a file called the deletions file.

Complete the flowchart by using the following boxes to replace the empty ones. Be sure to write YES and NO for the decision boxes and to draw any necessary arrows.

Remember to write your examination number at the top of the page and detach the page and fasten it to your answer book.

