OCR 9-1 (J277) GCSE Computer Science

1 a day- Easter Revision

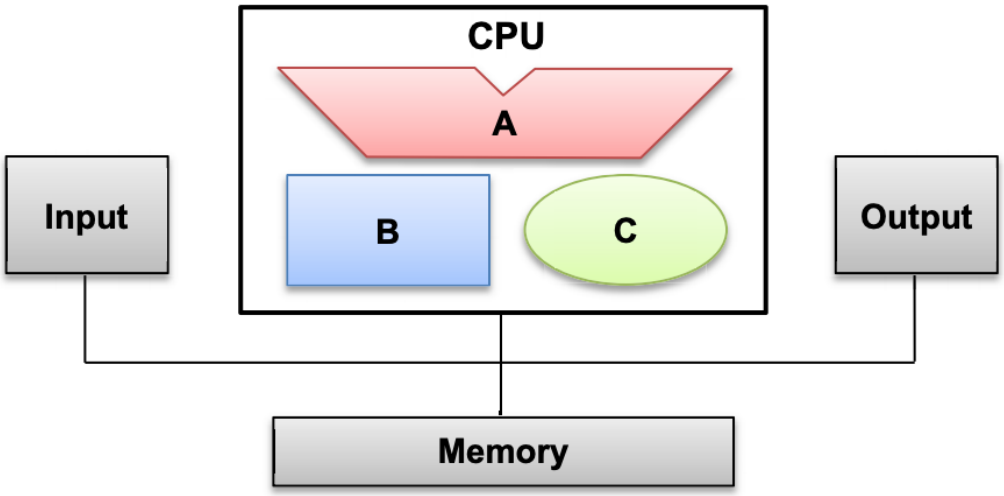
EXAM: 16th May & 6th June

NAME: _____

CLASS: _____

DAY 1

1. Below is an incomplete diagram of a Von Neumann architecture computer, with a single core Central Processing Unit (CPU).



(a) Identify components A, B and C above. [3]

Component A: _____

Component B: _____

Component C: _____

(b) Cache size, clock speed and number of cores are the three main factors that affect performance. Describe how performance is affected by these three factors. [6]

_____

_____

_____

_____

(c) Additional hardware components are used in most computer systems. Describe the role of each of the following.

(i) Motherboard. [2]

(ii) GPU. [2]

DAY 2

2. Explain what is meant by a 'runtime error' [2]

_____

_____

_____

_____

3. A local independent retailer wishes to store the details of customers on a computer system. A partially complete data structure design is shown below. Complete the table, suggesting:

- Three most suitable data types
- Three different methods of validation. [6]

Field name	Data type	Example data	Validation check
Customer ID		2	
First Name	String	John	Presence check
Surname	String	Smith	Presence check
Gender		M	Presence check
Date of birth	Date	23/04/1967	
Address	String	123 Park Avenue	Presence check
Post code	String	CF12 3DT	
Telephone number		029 2026 5137	Length check

4. Cyber security is essential in the protection against different types of malware.

(a) Describe two methods of protection against the use of key loggers. [4]

(b) Describe two characteristics of a worm. [2]

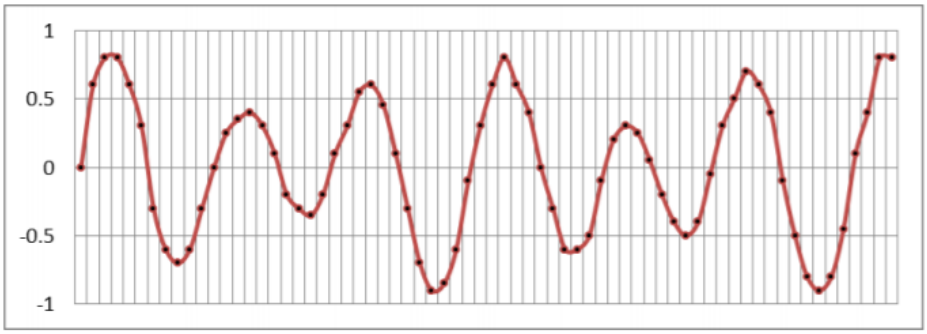
5. TCP/IP is a protocol used for communication between computers when transmitting data over networks.

(a) Complete the diagram below, which shows the typical contents of a TCP/IP packet. [3]

The source address	.....
.....	
Other tracking information	
The data itself	.....

DAY 3

6. Sound sampling is used in the digital storage of sound



(a) Explain the process of sound sampling. [3]

(b) Describe how sound samples are stored. [2]

(c) Give two examples of metadata stored in sound files. [2]

(d) A lossy algorithm is used to compress a sound file whose original file size was 960 KB.

(i) Describe how a lossy algorithm would compress the sound file. [2]

(ii) Following compression, the sound file size is reduced to 80 KB.

Calculate the compression ratio. [2]

DAY 4

7. What is meant by 'serial access' (1)

_____

_____

8. Explain the importance of 'hyper threading' when the CPU processes data (2)

_____

_____

9. State 2 advantages of Optical storage (2)

_____

_____

10. Give 2 security measures that can be adopted by having a LAN (2)

_____

_____

11. State the one piece of data every data packet being transmitted must contain (1)

_____

12. Explain the purpose of a Switch (2)

_____

_____

13. What purpose does POP3 serve (2)

_____

14. What device carries out Packet Switching (1)

15. What is a Firewall (2)

16. Name 3 system utilities (3)

17. What is a 'Differential' back up (1)

18. State 2 features of the FOIA (2)

DAY 5

19.

A school divides students into house groups based on the month that they were born in. Students born in January, February, March or April are put into Needwood house. Students born in May, June, July or August are put into Marchington House. All other students are put into Trent house.

Using pseudocode, write an algorithm that will:

•Ask the user to enter a number (1 to 12) relating to their birth month

•Decide which house they are in and print this out.

•Keep a running total of how many students are in each house.

•Repeat the above for 20 students.

•When 20 students have entered their details, print out how many students are in each house.

(8)

20.

Ali's tablet computer has an operating system. Ali's computer uses virtual memory. Ali has written two procedures to help himself understand how virtual memory works.

storeData() describes how data is stored in RAM.
accessData() describes how data is read from RAM.

Write the letter of the missing statements from the table in the correct place to complete the algorithms. Not all statements are used, and some statements might be used more than once.

```
procedure storeData()
    if RAM is ..... then
        move data from RAM to .....
    endif
    store data in next free space in .....
.....
procedure accessData()
    if ..... (data required is in RAM) then
        if RAM is full then
            move unneeded data from RAM to HDD
        endif
        move required data from HD to RAM
    endif
    read data from .....
endprocedure
```

Letter	**Statement**
A	Secondary storage
B	NOT
C	Full
D	endfunction
E	Empty
F	endprocedure
G	AND
H	RAM

[6]

21.

A car dealership uses a computer system to record details of the cars that it has for sale. Each car has a make, model, age and number of miles driven.

The car dealership sells electric cars, which require charging before they can be driven. Charging the battery by 1% takes 10 minutes.

For example, a battery has 80% charge. It would take 200 minutes, or 3 hours and 20 minutes to charge to 100%.

Write an algorithm that:

- asks the user for the current battery charge percentage
- outputs "full" for a battery currently at 100%
- calculates how long this battery would take to charge
- outputs this in hours and minutes.

(6)

22. TOUGHEST QUESTION TIME

OCR Land is a theme park aimed at children and adults. Entrance tickets are sold online. An adult ticket to OCR Land costs £19.99, with a child ticket costing £8.99. A booking fee of £2.50 is added to all orders.

OCR Land keeps track of the size of queues on its rides by storing them in an array with the identifier **queuesize**. It uses a bubble sort algorithm to put these queue sizes into ascending numerical order, based on the shortest wait time. This information is then displayed on LED boards around the park to encourage customers to access rides with a shorter waiting time.

Produce a bubble sort algorithm that will order the queuesizes correctly.

(6)

MARK SCHEME

QUESTION	ANSWER(S)	MARKS AWARDED
1 (a)	Component A: Arithmetic Logic Unit Component B: Register Component C: Control unit	3
(b)	Cache size • More cache memory improves the performance as it can provide instructions and data to the CPU at a much faster rate than other system memory such as RAM. • More cache memory will allow more instructions that are repeatedly used by a CPU to be stored, and therefore increase the hit rate; increasing performance as a result. Clock speed • The faster the clock speed, the faster the computer is able to run the fetch-decode-execute cycle and therefore process more instructions. • The faster the clock speed, the more power is generally required which creates greater requirements for heat dissipation and can place more strain on battery life. Number of cores • In a single-core CPU each instruction is processed one after the other, whereas in a dual-core CPU, two instructions may be processed at the same time. In theory, dual-core CPU should mean that the computer can process instructions twice as fast as a single-core CPU. • Performance may be affected where one core is waiting on the result of another and therefore cannot carry out any more instructions, leading to the performance being no better than a single core processor.	6

QUESTION	ANSWER(S)	MARKS AWARDED
(c) (i)	• A motherboard provides connections between many of the components used by computer systems, • such as the CPU, memory, hard disc interface, expansion slots and other peripherals.	2
(ii)	• GPUs are specialised electronic circuits designed to rapidly manipulate and alter memory • GPUs efficiently manipulate computer graphics and carry out image processing.	2
2	• runtime error is a program error that occurs while the program is running • This type of error causes a program to continually use up more RAM while the program is running until the program crashes	2
3	1 mark for each correct data type x3 1 mark for each suitable data validation	6

QUESTION	ANSWER(S)	MARKS AWARDED
4 (a)	• Prevent physical access to the keyboard input port, e.g. USB (1), to eliminate the risk of pass through connectors, which captures the key presses (1). • Prevent the installation of device drivers or other low level software (kernel hacks) (1) which records input via the keyboard to a file (1).	4
(b)	**Any two of:** • A worm will often target existing open ports that are not sufficiently secured • A computer program that copies itself to other computers across a network • Unlike a computer virus, it does not need to attach itself to an existing program • Worms often infect computers by exploiting bugs / security failures in legitimate software.	2
5	• The destination address • Reassembly data / packet order number • Error checking data / checksum	3
6 (a)	• Sampling is a method of converting an analogue sound signal into a digital file. • At specific intervals (frequency) a measurement of the amplitude (bit depth) of the signal is taken. • The higher the sampling rate / bit depth the better the quality of the sound file	3

QUESTION	ANSWER(S)	MARKS AWARDED
6 (b)	• The amplitude of each sound sample is converted into the equivalent binary number. • The whole collection of data (binary numbers) is then stored in a digital file.	2
(c)	• Type • Duration • File size • Bit rate • Sampling rate • Channels • Volume	2
(d) (i)	• Sound files are compressed using a lossy algorithm by analysing the waveform and removing sound that cannot be heard by people. • To increase the compression, lossy algorithms remove more data which reduces the quality of the sound file (lowers fidelity)	2
(ii)	• $\boldsymbol{Compression\ ratio = Original\ file\ size / Compressed\ file\ size}$ • 960Kb/80kb = 12: 1	2

7. Serial access refers to data being read record by record in order

8. Based on the number of cores the CPU has it can simultaneously process data at the exact same time (1) for example a dual core processor can process 4 threads (tasks) at a time (1)

9. Portable/Not susceptible to magnetic fields/inexpensive for small capacity

10. RDC/Keylogging/Inspect user areas

11. IP Address

12. TO prevent data collisions (1) it prevents these collisions by receiving the data itself then making a direct connection to the individual device that requested the data and then transmitting it (1)

13. Retrieves mail from server (1) removes email data once retrieved from internet server (1)

14. Router

15. A program that sets rules (1) for how data packets enter/leave the network (1)

16. Backup/System restore/defragmentation/Compression

17. Differential backups store ALL changes made from the original back up

18. Public authorities publish certain info about their activities (1)/Member of public are entitled to request information form public bodies (1)

19.

- Initialising variables at the start for count of students in three houses
- Suitable loop that repeats 20 times
- Inputting the birth month as a number
- Printing out message AND adding 1 to counter if birth month is between 1 and 4
- Printing out message AND adding 1 to counter if birth month is between 5 and 8
- Printing out message AND adding 1 to counter if birth month is between 9 and 12
- Printing out totals for all three counters at the end.

Example:

```
N = 0
M = 0
T = 0
FOR x = 1 to 20
INPUT birthnum
   IF birthnum = 1 or birthnum = 2 or birthnum = 3 or birthnum = 4 THEN
print "Needwood house"
            N = N + 1
ELIF birthnum = 5 or birthnum = 6 or birthnum = 7 or birthnum = 8  THEN
print "Marchington house"
            M = M +1
ELIF birthnum = 9 or birthnum = 10 or birthnum = 11 or birthnum = 12  THEN
print "Trent house"
```

20.

Question			Answer/Indicative content	Marks

20			1 mark for each letter in the correct place
			
			procedure storeData()
			if RAM is **C/Full** then
			move data from RAM to **A/Secondary Storage**
			endif
			store data in next free space in **H/RAM**
			F/endprocedure
			procedure accessData()
			if **B/NOT** (data required is in RAM) then
			if RAM is full then
			move unneeded data from RAM to HDD
			endif
			move required data from HD to RAM
			endif
			read data from **H/RAM**
			endprocedure
				6

21			1 mark per bullet, max 6 • Inputs the current battery charge percentage • Outputs "full" if 100% • Calculates the amount to charge • Calculates the time in minutes… • …converts to hours and minutes • Outputs the time in hours and minutes	6

22.

- Use of iteration (correctly applied)
- Use of Boolean (true/False)
- Use of conditional statement
    - Correct referencing to values within array
    - Correct operations carried to swap the position of two numbers if one is less than it's next value (p+1)
- Use of temporary variables (avoid overwriting values within the array)

EXAMPLE:

```
01  swaps = True
02  while swaps
03          swaps = False
04          for p = 0 to queuesize.length-2
05                  if queuesize[p] > queuesize[p+1] then
06                      temp = queuesize[p]
07                      queuesize[p] = queuesize[p+1]
08                      queuesize[p+1] = temp
09                      swaps = True
10                  endif
11          next p
12  endwhile
```