

12 Tudalen

Cyfarwyddiadau i Ymgeiswyr

1. Rhowch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhowch eich enw yn y lle a ddarparwyd ar y dde, plygchw ef a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddarllenadwy. Gall yr Arholwyr naill ai anwybyddu sgrïpt annarllenadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynt.
6. Ni ddylid rhwygo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwyliwr/gwylwyr.
8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

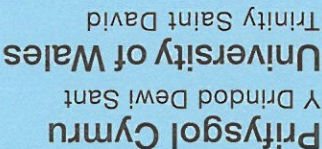
1	Rhif Myfyriwr	
2	Teitl y Papur Arholiad	
3	Cod y Modwl	
4	Dyddiad ac Amser yr Archoliad	
5	Lleoliad yr Arholiad	
6	Rhif Sedd	
7	Nifer y Llyfrau Atebion a gyflwynwyd	

(See the other side for English version)

Llenwch, plygwch a seliwch (gweler nodyn 2 isod)

CYFENW:

ENW(AU) CYNTAF: _____

[illegible]

Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.

2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.

3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing

4. Write your answers in ink.

5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.

6. No part of this book is to be torn out; it must be handed in complete.

7. If more books than one are used, fasten them together using the tags available from the invigilator(s).

8. Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.

1	Student Number	
2	Title of Examination Paper	Computer Architecture and Operating Systems
3	Module Code	ACCA 4022
4	Date and Time of Examination	19/05/25 9:30
5	Examination Venue	TX CDM MAIN HALL
6	Seat Number	C3
7	Number of Answer Books handed in	1

(Gweler yr ochr arall am y fersiwn Cymraeg)

Office Use	numbers of the questions you attempted
6	100
6	9
4	8
6	8
3	0
~~0~~	1
0	9
0	90
4	9
4	30
4	5
2	0
20	4
57	Total

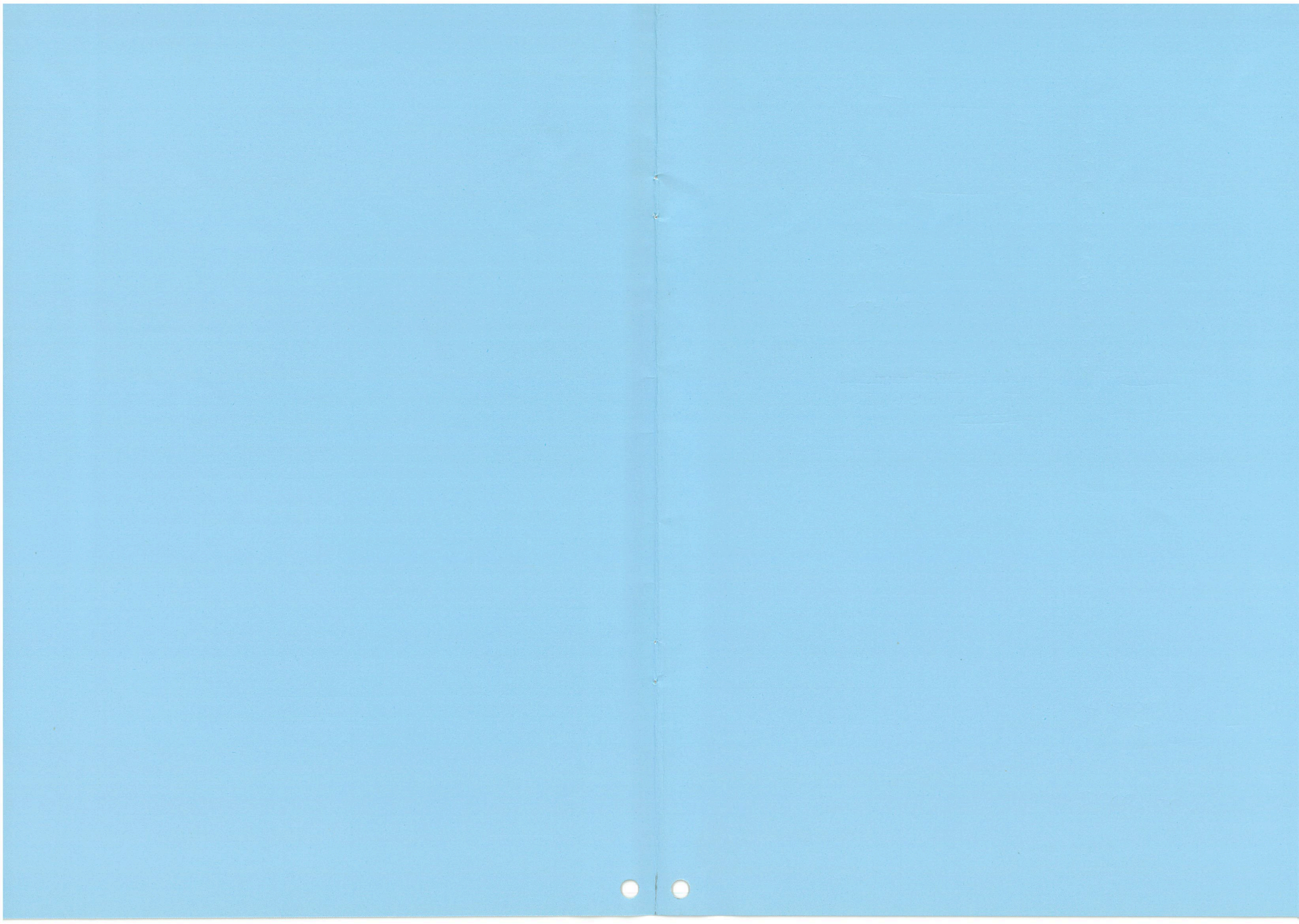
Complete, fold and seal
(see note 2 below)

SURNAME:

BUCKLEY

FORENAME(S):

Kyle



N.B: ANSWERS BEGIN ON PAGE 2

20	1
21	2
22	4
23	8
24	16
25	32
26	64
27	128
28	256

2-1	0.5 ₁₀
2-2	0.25
2-3	0.125
2-4	0.0625
2-5	0.03125
2-6	0.015

Allocate 35 minutes.

Ques. 1 ✓ (8 marks) ✓

Hex to Binary
Hex to Decimal

Ques. 2 Allocate 20 minutes

Marked / on answer sheet
Cable snake (u, e, s) - role? mechanisms.

Ques. 3.

STANDARDS / TRANSFER RATES

REGISTRATIVE. (Dynamic non configuration protocol)

Ques. 4.

"cost effective" change & central posture PC.

NOTE TO EXAMINER:

FINAL ANSWERS ARE UNDERLINED

LINE SO.

1(a)(i)

cont.

$$\begin{array}{r} 81_{10} \\ - 17 \\ \hline 64_{10} \end{array} \leftarrow 2^6$$
$$\begin{array}{r} 16_{10} \\ - 1 \\ \hline 15 \end{array}$$

BINARY EXPANSION:

$$\begin{array}{cccccccccccc} 2^6 & 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 & & & & & \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \end{array}$$

FINAL CONVERSION:

$$\begin{array}{r} 2^6 = 64 \\ + 2^4 = 16 \\ + 2^0 = 1 \\ \hline 81_{10} \end{array}$$
$$\begin{array}{r} 1010001_2 \end{array}$$

cont.

$$\begin{array}{r} 123_{10} \\ - 59 \\ \hline 64_{10} \end{array} \leftarrow 2^6$$
$$\begin{array}{r} 11_{10} \\ - 8_{10} \\ \hline 3_{10} \end{array} \leftarrow 2^3$$
$$\begin{array}{r} 27_{10} \\ - 27_{10} \\ \hline 0 \end{array} \leftarrow 2^5$$
$$\begin{array}{r} 1 \\ - 1 \\ \hline 0 \end{array} \leftarrow 2^0$$

1(b)

CPU: Minimum SPEC

CPU	Intel i5-4590 or equivalent
RAM	6GB DDR3 (4 x 1GB) (or higher)
OS	Windows 10 Home (or Enterprise) Windows 11 if looking to future proof
GPU	Nvidia RTX 2070 Super with 8GB VRAM
SSD Storage	2 to 3 TB of 100,000 IOPS SSD, 1TB NVMe M.2
Storage	500GB SATA
Case	ATX form factor
Cooling	6 7000 RPM case fans
Power Supply	750 Watt Gold rated modular power supply

Cabling has been left out of parts list, as have displays. The above should cost between £1000 and £1500 depending on source and time of purchase. This system will be able to stream high fidelity media and play modern games on high setting presets from assembly without tinkering with BIOS settings.

1) (c) Hex to Binary

$$\begin{array}{r} 6A_{16} \\ \downarrow \\ 0110_2 \end{array}$$

Final conversion:

$$\begin{array}{r} 01101010_2 \end{array}$$

CHECKS:

$$6A_{16} = 9$$

$$A(10) \times 16^0 = 10$$

$$+ 10 \times 16^1$$

$$\begin{array}{r} 2^1 \\ 2^2 \\ 2^3 \\ 2^4 \\ 2^5 \\ 2^6 \end{array}$$

$$\begin{array}{r} 2 \\ 8 \\ 32 \\ 64 \end{array}$$

$$\begin{array}{r} 10610 \end{array}$$

12) (b)

3C

$$\begin{array}{r} 3C_{16} \\ \downarrow \\ 0011_2 \end{array}$$

Final conversion

$$\begin{array}{r} 00111100_2 \end{array}$$

13) (b)

a) B3

$$\begin{array}{r} 11B_{16} = 17 \\ 3_{16} = 3 \end{array}$$

$$\begin{array}{r} 1011_2 \\ \downarrow \\ 0011_2 \end{array}$$

$$+ 17 \times 16^1$$

Final conversion

$$\begin{array}{r} 179_{10} \end{array}$$

14) (b)

$$\begin{array}{r} 4C_{16} \\ \downarrow \\ 0100_2 \end{array}$$

$$\begin{array}{r} 4_{16} = 4 \\ 12_{16} = 12 \end{array}$$

Final conversion:

$$+ 76_{10}$$

14)

plate, and the time of least as the parking authorities time limit per day.

Driver exists to rotate IP addresses in a local system, and to provide temporary users (such as in a cafe or business office building) with a temporary access right to the network.

The following system would be recommended for the use case, such that it is for recreational gaming and other media playback in addition to daily browsing.

Firstly, a Mother Board with $\times$ USB 3.0 or higher (including up to USB 3.2) at minimum to provide interface with input device such as a keyboard, and mouse. Onboard WiFi, with an Ethernet (802.11) port must be considered for connection to the modern TV ("smart TV") with the following usual interface ports as backup (HDMI, DVI, VGA) for network outages.

Although, Linux distributions can achieve ~~network~~ screen casting to a video sink for example, Chrome has functionality to stream the ~~device~~ source audio and video across the local area network to a target machine. Windows also has this functionality in its enterprise level installations, although not in bare user package (Windows 10 home.)

As far as components go, to maximise cost efficiency and power an older (5th $\rightarrow$ 7th) generation Intel i5 - i6900 would serve purpose of running most modern games with little issue even without overlocking through the BIOS.

3a)d) A Blu-ray disc would be expected to see storage of N/A .

3a)e) A current £80 HDD (Seagate, Kingston) should warrant storage capacities of ~~between 1 and 2 TB~~ (Terabytes).

3a)f) A £100 NVME M.2 module produced by Kingston would warrant storage capacity of $\frac{1}{4}TB$.

3b)i) Typical transfer speeds for an NVME M.2 Storage unit would be expected at a standard of around $\frac{5.2GB}{s}$ (Gigabits per second)

3b)ii) An average HDD would see a transfer rate of 60 - 100 MB/s. [Units of unit] MB/s (Megabits per second)

3b)iii) A SATA SSD would be expected to perform at a rate of ~~3.5 GB/s~~ 6GB/s. (Gigabits per second)

3c) Dynamic Host Configuration Protocol (DHCP) is a networking protocol which leases IP addresses out to devices on the local area network, with a variable time of lease as dictated by the network administration policies.

It is used in a high-metric IP addresses are held on a table, with details such as lease time and device MAC address. In this, it may be thought of as a public car park where the IP address represents the parking space reference, the unique MAC address as a vehicle registration

4e)

4 bit number 0000₂ through 1111₂ 0₁₀ through 15₁₀

$[2^n]$ values can be represented by an n -bit representation, where n is the number of bits with $2^n - 1$ representing the upper bound, inclusive.

upper: $2^n - 1 \rightarrow 16 - 1 = 15_{10}$ as such, θ inclusive 16 values may be represented.

4f)

Full colour (0-16)⁷ [Add units at end!]
 $256 * 350$
Each pixel can be 1 of 16,000,000 colours

BMP $\rightarrow$ 32bit
ID : 1
compression ratio.

$256 * 300 = 50000$ 18 [over]

16,000,000 x 60,000
 $600 + 300 + 60$
BITMAP: 12,000,000,000,000 bits
(BMP) format

Spec: 12,000,000,000 bytes.
format

12,000,000 Mega Bytes (MB)

200 Mega Bytes
8 Mega Bytes

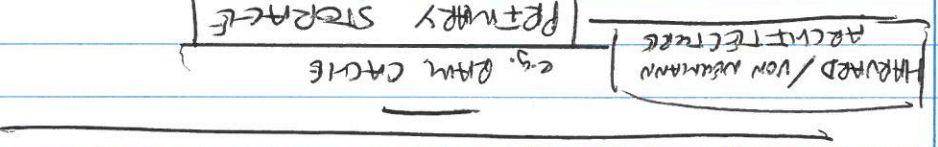
8 MB/s

1 MB/s

1 MB/s

200 seconds for full transfer

or 3 minutes and 20 seconds
for file upload.



Cache is a small, but very fast storage module embedded into the CPU (central processing unit). It is a volatile storage, similar to the larger Random Access Memory modules installed on the motherboard.

If we are to consider RAM as primary storage in a system, faster yet more compact compared to a hard disk drive (and even a solid state drive) with use for storing commonly accessed data used by initialised programs to reduce access time overhead, then we are to consider cache

2a)

2b)

RAM modules as faster still.

A system may have between half a TB to several TB of primary storage. Depending on the format (HDD, SSD, SSHD, NVMTE) the speeds range from up to 100 MB/s read/write speed as seen with solid state drives.

RAM modules are faster still, and CPU cache storage faster again.

However, speed of data transfer & size of storage or storage capacity, are ~~inversely~~ inversely proportional.

Cache is typically partitioned into several levels, with increasing read/write speeds and decreasing storage as we "descend" the layers.

For example, level 3 caches may be sized at 512 MB with a speed of 16 GB/s.

Level 2 may be sized at 256 MB, and doubly as fast (2 GB/s).

Level 1, the primary cache level, may see these speeds doubled again, or faster, with a greatly reduced storage; 128 MB or less. This all varies subtly in manufacture, and greatly with era of chipset manufacture. (Think in a vein similar to car engine capacity and speed: a 1954 Bentley is powerful but pales next to a Ferrari or F1 track vehicle fabricated this year)

The purpose of caches as to store machine codes, pointers, references, and other ~~code~~ low level operands to reduce time overhead in the CPU's operations so that it can continue allocating time slices to other components.