

Computer Systems Fundamentals Assignment

by James William West

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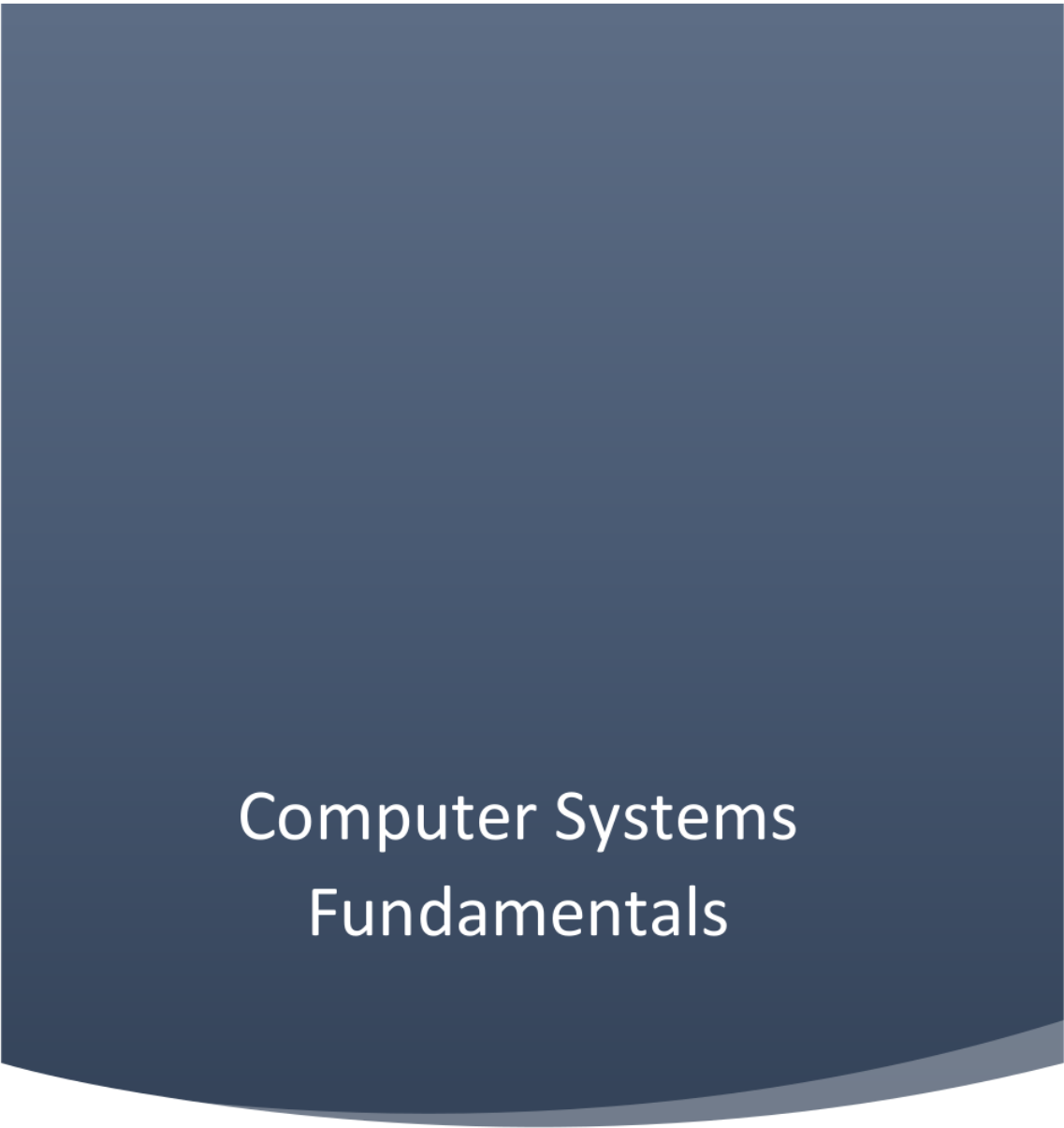
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Computer Systems Fundamentals

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1 Introduction

The following report will include a variety of studies which illustrate my knowledge and understanding throughout this year's Computer Systems Fundamentals course. I will be looking into the specifications of my own computer at home, which will include the make and model, RAM, the CPU and its main specifications, and also the connectivity/ports used. I will also be creating my own Home Theatre PC (HTPC) which includes choosing the all the specifications required, from the CPU, graphics card and even the monitor. A shopping list will also be made of all the parts needed to build my HTPC, the retailer where these items may be purchased and the price.

2 My Computer Specifications

Having built my computer back in 2020 for gaming, the specifications are as follows:

2.1 Make and Model

As this computer was a custom build it doesn't have a specific make but the model of the motherboard being used is a ROG STRIX B360-I GAMING and was manufactured by ASUS TEK COMPUTER INC. I decided to use this as reading several reviews of various motherboards used for gaming, this offered the best quality for a reasonable price. The specifications of the ROG STRIX B360-I GAMING motherboard are shown in the image below.

Specifications	B360-I GAMING
CPU	Intel Socket 1151 for 8th and 9th Generation Core i7/i5/i3/Pentium Processors
Chipset	Intel B360
Memory	2 x DIMM, Max. 32GB, DDR4, 2666/2400/2133 MHz Non-ECC, Un-buffered Memory
Graphics	Intel HD Graphics support
Multi-VGA output support	HDMI 1.4b and Displayport 1.2
HDMI Resolution	4096 x 2160 @ 24 Hz / 2560 x 1600 @ 60 Hz
Displayport Resolution	4096 x 2304 @ 60 Hz
Shared memory	1024 MB
Expansion Slots	1x PCIe 3.0/2.0 x16
First M.2 Socket	M.2 Socket 3, with M key, type 2242/2260/2280 storage devices support (SATA mode & x4 PCIe mode)
Second M.2 Socket	M.2 Socket 3, with M key, type 2242/2260/2280 storage devices support (x4 PCIe mode)
SATA 6Gb/s ports	4
Intel Optane Memory Ready	Yes
LAN	Intel I219-V Gigabit LAN
Wi-Fi	Wi-Fi with MU-MIMO 802.11 a/b/g/n/ac supports dual frequency band 2.4/5 GHz
Bluetooth	v5.0
Audio CODEC	ROG SupremeFX S1220A 8-Channel High Definition Audio CODEC
USB3.1 Gen 2 Ports	2 (on back panel, red)
USB3.1 Gen 1 Ports	3 (1x Type-A (blue) 1x Type-C on back panel, 2 onboard)
USB2.0 Ports	4 (2x on back panel (black), 2 onboard)
Back I/O Ports	Displayport, HDMI, 2x USB 2.0 (black), 1x USB 3.1 (blue), 1x USB 3.1 Type-C, LAN, 2x USB 3.1 (red), Wi-Fi and BT, Optical out and 5x Audio jacks
Accessories	User manual, I/O Shield, 2x SATA 6Gb/s cables, 2x M.2 screws, Supporting DVD
Operating System	Windows 10 64bit
Form Factor	Mini-ITX, 170 x 170 mm

Figure 1: ROG STRIX B360-I GAMING Specifications

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2.2 RAM

My computer is currently running 16GB of RAM, as this PC was built for gaming purposes, I decided that 16GB would be reliable to play any game available and would leave an optimum amount of memory spare. Even though 8GB of RAM would have been enough to run most games, I wanted to make sure I had enough room to run any game no matter the size.

← Back to results



Corsair Vengeance RGB PRO 16 GB (2 x 8 GB) DDR4 3200 MHz C16 XMP 2.0 Enthusiast RGB LED Illuminated Memory Kit - White

Visit the Corsair Store
★★★★★ 5,860 ratings
Amazon's Choice for "white ram"

£70³⁰
& FREE Returns

Pay £70-£60 (£40.30): get a £30 Amazon Gift Card on approval for the Amazon Classic Mastercard. Terms apply.
Promotion Message 33% Off on Xbox Game Pass for PC. 1 promotion

Note: This item is eligible for **FREE Click and Collect** without a minimum order subject to availability. [Details](#)

Brand	Corsair
RAM memory technology	DDR4
Computer memory size	16 GB
Memory speed	3200 MHz
Voltage	1.35 Volts

About this item

- Dynamic multi-zone RGB lighting: 10 ultra-bright RGB LEDs per module
- Custom performance PCB: Provides the highest signal quality for the greatest level of performance and stability
- Package memory pin: 288. Tightly screened memory: Carefully screened ICs for extended overclocking potential. Tested latency: 16-18-18-36
- Maximum bandwidth and tight response times: Optimized for peak performance on the latest Intel and AMD DDR4 motherboards
- Next generation software: Take control in Corsair iCUE software and synchronize lighting with other Corsair RGB products, including CPU coolers, keyboards and fans; also supported by gigabyte RGB fusion and MSI mystic light

Roll over image to zoom in

Figure 2:RAM

2.3 CPU and It's Main Specifications

My PC is using an Intel(R) Core (TM) i7-8700 CPU, I decided to go with this as The Core i7-8700 is a 65W processor with 6 cores, 12 threads, 12MB of cache, and a 4.6GHz maximum turbo frequency. It also has 16 PCI Express lanes and can accommodate up to 64GB of DDR4 memory, making it ideal for gaming. [1] These Intel(R) Core (TM) i7-8700 CPU specifications are shown in the image below.

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CPU Specifications

Total Cores ?	6
Total Threads ?	12
Max Turbo Frequency ?	4.60 GHz
Intel® Turbo Boost Technology 2.0 Frequency [†] ?	4.60 GHz
Processor Base Frequency ?	3.20 GHz
Cache ?	12 MB Intel® Smart Cache
Bus Speed ?	8 GT/s
TDP ?	65 W

Figure 3: Intel(R) Core (TM) i7-8700 CPU Specifications

2.4 Connectivity/Ports

As shown in the image below, the motherboard being used offers a variety of useful ports, these include:

- 2x Antenna Connectors (ASUS Wi-Fi GO! Module; Wi-Fi 802.11ac / Bluetooth 5)
- 2x USB 3.1 (Type A)
- 2x USB 3.0 (1x Type A & Type C)
- 2x USB 2.0
- 1x RJ45-LAN (Intel I219-V)
- 1x HDMI
- 1x DisplayPort
- 1x S/PDIF (optical)
- 5x Audio (SupremeFX S1220A)



Figure 4: ROG STRIX B360-I GAMING Motherboard Rear Ports

3 Internet Connectivity

The Internet is a global network of computers, with each computer connected to the Internet must have a unique address, this is known as an IP (Internet Protocol) address. An IP address is usually shown as a set of four numbers ranging for 0 to 255, meaning it can be seen as anything between 0.0.0.0 to 255.255.255.255 and is assigned by your internet service provider (mine being BT). The function of an IP address is to connect your computer to the internet indirectly by first connecting to a network linked to the internet, which then allows your computer internet access. Your internet activity passes through your internet service provider, which uses your IP address to deliver it back to you. [2] Operating system tools such as Windows PowerShell or ipconfig can be used to find out your home IP address as shown in the image below:

```
Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . : home
Link-local IPv6 Address . . . . . : fe80::21fd:b470:47ca:c46d%14
IPv4 Address. . . . . : 192.168.1.65
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.1.254
```

Figure 5: IP Address

A router will also provide users with a MAC (Media Access Control) address as well as an IP address. Unlike an IP address a MAC address is made up of 12-digit hexadecimal number with a colon or hyphen separating every two digits making it simpler to read, for example 00:0a:95:9d:68:16. Although both IP and MAC addresses are used to identify your computer on a network, a MAC address is used within the same local network and is used to route data. [3] BT Smart HUB Manager can also be used to find the IP and MAC addresses being used as shown in the image below.

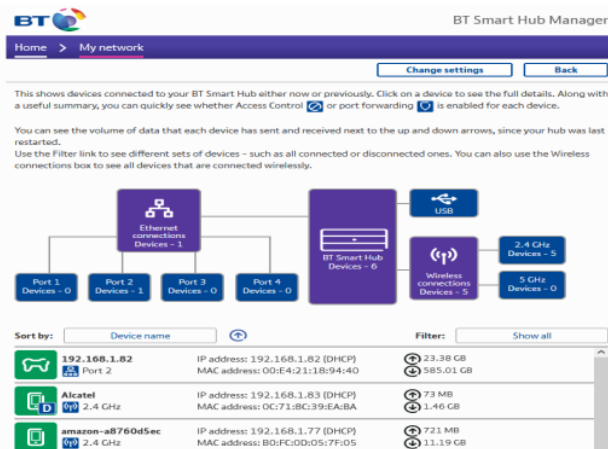


Figure 6: BT Smart Hub (IP and MAC address)

All modems/routers run at a different speed depending on several factors, whether it be location, the number of devices using the same connection, or even if your device is using Wi-fi or a wired connection. Internet speed is measured in Mbps (megabits per second) and the higher Mbps the more you can either upload or download. The upload speed and the download speed (both measured in Mbps) are used to measure the speed of your internet. The download speed refers to the number of Mbps it takes to transfer data from a server to your computer in the form of photos, text, video, files, or audio. Downloading data is required to watch videos on YouTube or listen to music. Where the upload speed shows how many Mbps you can send from your computer to another device, this would be used for video calls or online gaming so the faster the upload speed the better. [4] As shown in the image below (using www.speedtest.net) my computer currently has a download speed of 67.11 Mbps and a upload speed of 18.70 Mbps making it ideal for online gaming.

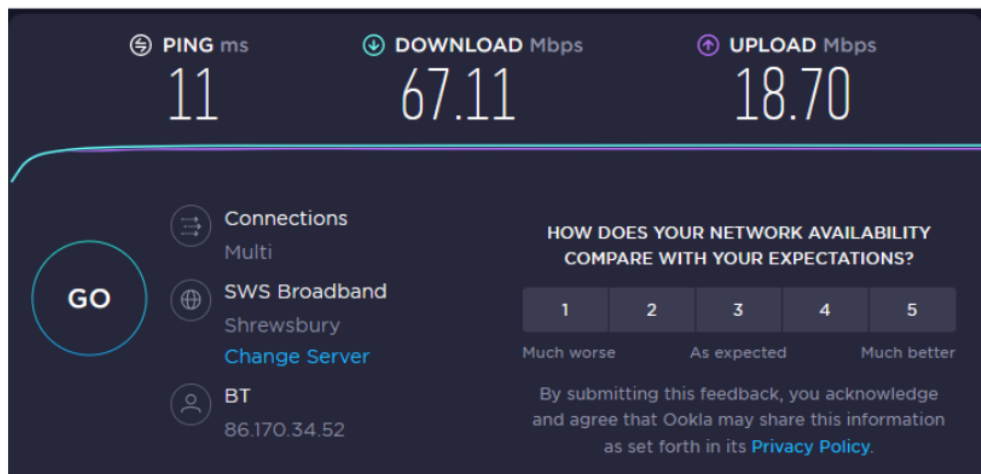


Figure 7: Upload/Download Speed

4 DHCP Server

Each modem/router has a DHCP (Dynamic Host Configuration Protocol) incorporated in it, and its function is to automatically provide and assign a unique IP address to its users. For example, in a large network, instead of a network administrator having to set up every client that joins the network their own personal IP address, the DHCP server will do it for you. [5] The downside to using a DHCP server is that it is open to a number of security risks, these are caused as DHCP protocol

requires no authentication so anyone can easily join your network. [6] Below are a few things that can be done to increase the level of cyber security at home:

- Use a guest network Wi-Fi for visitors
- Hide your Wi-Fi network name
- Enable MAC address filtering
- Make sure the router firmware is up to date
- Activate additional security features on the router
 - Virtual Private Network (VPN)
 - Application Layer Gateway (ALG)
 - Stateful Packet Inspection (SPI) Firewall [7]

5 *Home Theatre PC (HTPC)*

A HTPC (Home Theatre Personal Computer) is a computer that is the central hub for home entertainment, and the task below is to design my own HTPC. The aim of the HTPC is to stream videos at 4k and be able to connect to a separate Hi-Fi AV amplifier and speakers, with Dolby Digital 5.1 surround sound.

5.1 CPU and Motherboard

For the CPU I will be using an Intel - Core i3-7100T 3.4GHz Dual-Core Processor, the reason is that the Core-i3 offers enhancements to visual quality and colour for HD playback and immersive web browsing, can run 4k at 60 Hz, plus being great value for the performance required compared to other processors on the market. The motherboard chosen is an ASUS ROG Strix B450-F Gaming II AMD Motherboard, even though it's a little overkill with what's needed for the HTPC required, it provides all the input/output ports necessary and can comfortably be used to streaming 4k video.

5.2 RAM

The RAM being used for my HPTC is the Crucial RAM CT2K4G4SFS6266 8GB Kit (2x4GB) DDR4 2666 MHz CL19 Laptop Memory, I have chosen this as I believe 8GB of RAM is more than enough to run my HPTC efficiently and also allows space to download movies of my choice.

5.3 Non-Volatile Storage

For the non-volatile storage I will be using a SSD (Solid State Drive) for additional storage to build a library of favourite movies. A Crucial BX500 480GB 3D NAND SATA 2.5-inch SSD will be used as it has

a capacity of 480GB, is reasonably priced compared to similar capacity SSD drives and has great reviews online. This will be connected into the motherboards SATA port.

5.4 Input/Output Features

The output features necessary for my HTPC are:

- HDMI 2.0 port
 - Needed to connect my HTPC to a 4k monitor
 - Supports up to 4k at 60hz (2160p)
- Audio Output (3.5mm output jack)
 - Needed to connect to HTPC to a separate Hi-Fi AV amplifier & speakers.
- LAN Port
 - Needed to connect to the internet to stream movies online

The input features include:

- USB ports
 - Needed to connect wireless keyboard and mouse to navigate the HTPC
 - Can be used to download movies onto a USB drive as addition storage
 - Needed to connect wireless remote control
- DVD Drive
 - Needed to play DVDs at home

5.5 Graphics Card

As for the GPU a GIGABYTE Gv-n710d5-2gil Graphics Card NVIDIA GeForce will be used as it has a low-profile design allowing it to fit into a smaller case required for my HTPC, it also offers exceptional performance for streaming videos at 4k.

5.6 Case and Power Supply

The aim is for my HTPC to be built into a smaller case, so it looks neat and tidy at home, the case chosen for my design is the Silverstone SST-ML09B - Milo Slim HTPC Mini-ITX Silent Computer Case, as shown in the image below. The dimensions of the case are 21.5 x 35.1 x 8.9 centimetres, so with its size it can fit neatly into my home setup.



Figure 8: Silverstone SST-ML09B - Milo Slim HTPC Mini-ITX Silent Computer Case, black

As for the power supply I will use the Silverstone SST-SX550 - Strider SFX Series, 550W 80 Plus Gold PC Power Supply, I have chosen this as my power supply as it offers a 550-output wattage, whilst offering an air-cooling method with low noise.

5.7 Monitor

As the aim for my HTPC is the stream 4k video, a 4k monitor is essential for my setup. The LG 43" Smart 4K Ultra HD HDR LED TV will be the main focus of my HTPC setup, at 43" it offers a picture quality of 4k running at 60hz at a relatively cheap price (£349) compared to other monitors of similar quality.



Figure 9: LG 43" Smart 4K Ultra HD HDR LED TV

6 Shopping List

Type	Items	Retailer	Price
Processor	Intel - Core i3-7100T 3.4GHz Dual-Core Processor	Ebay	£115.31
Motherboard	ASUS ROG Strix B450-F Gaming II AMD Motherboard	Amazon	£105.57
RAM	Crucial RAM CT2K4G4SF56266 8GB Kit (2x4GB) DDR4 2666 MHz CL19 Laptop Memory	Amazon	£27.52
Wireless Remote Control	G10s Air Mouse 2.4GHz Zedo Wireless Remote For Google Android TV Box, Smart TV, PC, HTPC, Windows, Mac OS, Linux, Raspberry, Laptop, Presentation, Computers	Amazon	£8.99
SSD	Crucial BX500 480GB 3D NAND SATA 2.5-inch SSD	Amazon	£41.28
GPU	GIGABYTE Gv-n710d5-2gil Graphics Card NVIDIA GeForce GT 710 2 GB Gddr5	EBAY	£72.45
CASE	SilverStone SST-ML09B - Milo Slim HTPC Mini-ITX Silent Computer Case, black	Amazon	£62.41
Power Supply	SilverStone SST-SX550 - Strider SFX Series, 550W 80 Plus Gold PC Power Supply, Low Noise 80mm	CCL Computers	£60.51
Monitor	LG 43" Smart 4K Ultra HD HDR LED TV	Currys	£349
Keyboard and Mouse	Wireless Keyboard and Mouse for Mac - iClever GK08 Rechargeable Wireless Keyboard Ergonomic Full-Size Design, 2.4G Stable Connection Slim White Keyboard and Mouse for Windows, Mac OS Computer	Amazon	£25.49
DD 5.1 Amplifier and speaker package	Sony HT-S20R 5.1Ch Sound Bar with Subwoofer	Argos	£199
Total			£1067.50

7 DD 5.1 Amplifier and Speaker Setup

To complete my home cinema setup a DD 5.1 Amplifier and speaker package is required for surround sound to give the best home cinema experience. I've decided to go with the Sony HT-S20R 5.1Ch Sound Bar with Subwoofer as it offers five speakers and a subwoofer to work together to deliver a huge 400W of power output, and with Dolby Digital technology it provides high quality surround sound making it ideal for home cinema. I feel the Sony HT-S20R also looks slick and goes well together with the Silverstone SST-ML09B case chose for my HTPC. The diagram below demonstrates how my HTPC and amplifier would be set up at home alongside my chosen monitor.

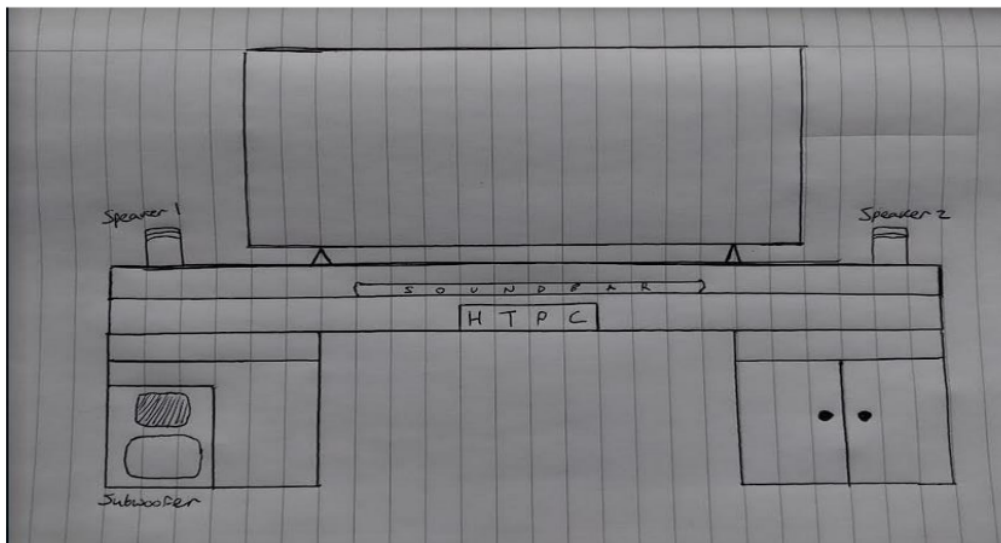


Figure 10: Home Cinema Set-Up Diagram

- The amplifier would be connected to my HTPC using a 3.5mm jack cable to produce audio
- HTPC would connect to home network using ethernet cable running from the back of HTPC into the home router.
- To produce the visual a HDMI cable would run from the back of the HTPC into the monitor

8 Bibliography

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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

67 /100

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GRADING FORM: GJ_2019

ENGAGEMENT WITH LITERATURE



Some engagement with literature demonstrated, but could have been even more extensive and covered all areas such as the DD 5.1 surround section etc. Note - a bibliography is not the same as a reference list in IEEE terms.

50

KNOWLEDGE AND UNDERSTANDING



IN general, fairly good K&U demonstrated in most areas, but even more research sources would have enhanced this mark further/

65

COGNITIVE AND INTELLECTUAL



Generally very good justification demonstrated in most areas.

78

PRACTICAL APPLICATION



Hmmm. Tricky. The general logic behind the component choices is mostly spot on, however, I suspect that there are a few glaring mistakes if one was to actually put this system together, e.g. Isn't the motherboard designed for AMD, yet you've

68

specified an Intel Corei3 ?? I suspect the motherboard is a standard size, yet the very lovely case, is Mini ITX, so it won't accept large boards
Also - you need an SPDIF multiplexed audio connector to transfer all the audio channels.
Usually this isn't via a 3.5mm jack as specified (but maybe there are exceptions?)

TRANSFERABLE SKILLS



Generally very well laid out and presented. Try to avoid using the "I" first person style in assignments like this.

73