

## **CPT160 – Computer Organisation / Introduction to Computer Systems Study Period 3, 2021**

### **Assignment 2 – Worth 25% (250 Marks)**

Due: 23:59 pm on Monday, the 22<sup>nd</sup> November 2021 in  
Week 13 Study Week

**Note:** Some questions of this assignment require independent research. All references used (books, web sites, etc.) must be disclosed in your submission. This may be done either through providing citations throughout your work, or by including a bibliography at the end of the document. Read and follow all the instructions carefully. Failure to do so is not grounds for extensions

### ***Plagiarism:***

This is an individual assignment and must be your own work. Plagiarism is a very serious offence. Plagiarism in oral, written or visual presentations is the presentation of the work, idea or creation of another person, without appropriate referencing, as though it's one's own. Plagiarism is not acceptable and may result in charges of academic misconduct, which carries a range of penalties. It is also a disciplinary offence for students to allow their work to be plagiarised by another student. For details, please check the course guide.

### ***Research, Collaboration and Academic Integrity***

There is a research component to this assignment:

- Any direct references, figures, or quotes used must be cited, and

**A bibliography should be included as an appendix at the end of your report. 26 marks**

*We will not accept citations from any encyclopaedic resource; e.g. Encyclopaedia Britannica, Encarta, World Book, Wikipedia (or syndication thereof), and so on.*

You may share and discuss any links and references you find relevant to completing this assignment on the discussion forums, so long as you include how you found the resource that you mention.

You are free to refer to textbooks, notes, work in study groups etc. to discover approaches to problems; however the assignment should be your own individual work.

Do not ever simply copy and paste what another writer has written. This is stealing. What we need is your own words – your own understanding. If you try to represent someone else's work as your own it will be dealt with severely. Instead, we want you to paraphrase what others have said – to put the concepts they have discussed into your own words.

When preparing a report such as this it is almost impossible to prepare an accurate report without referring to some resources for assistance to complete the tasks.

For this reason, we ask you to reference from where you get your information. We require these references to be formally correct according to one of the standard styles used in research. For example, either the APA or Harvard styles would be acceptable. See the RMIT library reference guides <https://www.rmit.edu.au/library/study/referencing> for further details.

Let us say that I want to use the ideas in the following paragraph to explain bit depth as it relates to images:

Bit depth refers to the colour information stored in an image. The higher the bit depth of an image, the more colours it can store. The simplest image, a 1-bit image, can only show two colours, black and white. That is because the 1 bit can only store one of two values, 0 (white) and 1 (black). An 8-bit image can store 256 possible colours, while a 24-bit image can display about 16 million colours.

The above paragraph was taken from the website:  
<http://etc.usf.edu/techease/win/images/what-is-bit-depth/>

The first step might be to paraphrase the information about – that is to put the information above into your own words, such as:

Bit depth signifies how many colours that can be represented in an image – the more bits per pixel the wider the range of colours (Techease, 2018)

This would then be cited in your reference list as:

*Techease, 2018, "What is bit depth?", Retrieved from <http://etc.usf.edu/techease/win/images/what-is-bit-depth/> at 7 pm on Saturday 8th March, 2018.*

You would reference this citation similarly in the bibliography.

Please note that we require you to have both a reference list and a bibliography. The difference between these two resources is that the bibliography lists all documents that you have read that have contributed to your submission whereas the reference list only lists those documents you have actually cited in the text of your report.

Also, with the exception of very short quotes (less than a line) we require you to put the content in your own words – we are assessing you on your understanding of the course content, after all. If you quote directly from a source, please ensure that the quote is within “talking marks” such as the ones I have just used. Whether you quote directly from a source or paraphrase the source (as I have done above) you still need to cite the source and ensure the source is included in the reference list and bibliography.

***Extensions:***

If you want to seek an extension of time for assignment submission, you must have a substantial reason for that, such as unexpected circumstances. Reasons such as, unable to cope with study load, is not substantial. Please contact your instructor.

***Submission:***

Prepare the answers to this assignment in an electronic format, and convert to a single Acrobat PDF (.pdf) file for submission. Paper submissions are not accepted; if some parts of the assignment have been completed by hand, scan these in and include this in your electronic submission.

***How to Submit***

- You should submit your assignment via Canvas using the Assignments -> Assignment 2 Submission link.
- You may resubmit the assignment if you need to, only the most recent version will be marked.

***Penalties:***

Submission files not in the required format will incur deduction of 2 marks. A penalty of 10% per day of the total available marks will apply for each day being late. After 5 days, you will receive zero mark for the assignment.

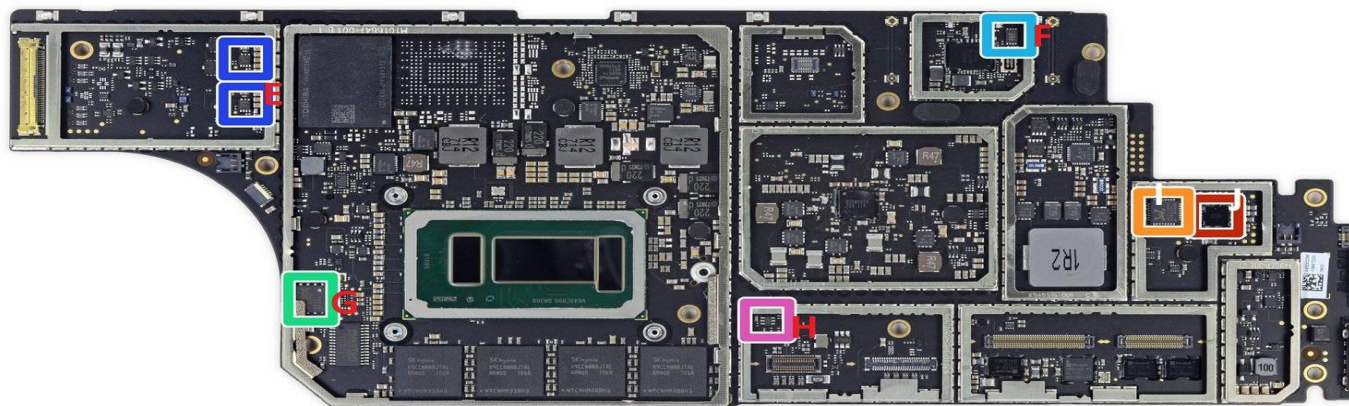
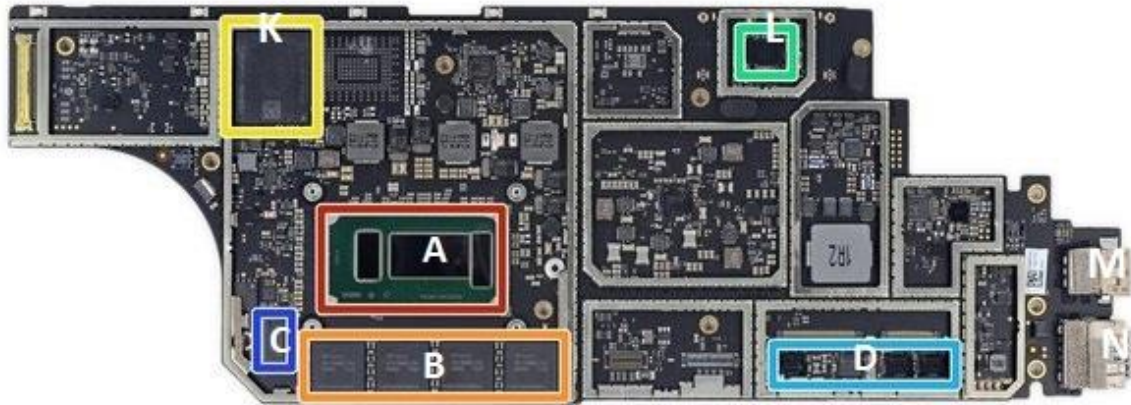
## Part A: System Architecture- 120marks

The pictures below are of a modern commercial laptop motherboard, the “Microsoft Surface Laptop”; both the main circuit board and the port panels of the motherboard are shown below. The questions in this part refer to this board / port panels and the labelled components.

### Main Circuit Board

Answer the following questions *in your own words, and in the context of this specific motherboard make and model*. Where explanations are required as part of an answer, they need not be longer than a paragraph (2-4 sentences) or summarised as dot points.







1. For each of the 8 components labelled **A, B, C, D, E, F, G, H, I** and **J** in the above diagram:

- a) What is the name generally given to that component?
- b) What is that component designed for and given details about the component?

**(10x (1+3) = 40 marks)**

2. For each of the following headers or set of pins or internal/external expansion connectors or communication ICs(integrated circuits) , labelled **K, L, M, and N**:

- a) What is the name generally given to that component?
- b) Give a typical example of what might connect to it or what communication is provided.
- c) What standard(s) are supported by that connector/IC? Provide details where relevant or appropriate, such as the version(s) of standards supported, and their maximum bandwidth if relevant.

**((1+1+4) x4 = 24 marks)**

3 As you observe the design of this of the “**Microsoft Surface Laptop**” is quite different to a usual desktop. Please answer the following questions.

- i. Describe the type of core architecture of this CPU. You must state the type of processor, the CPU architecture, the number cores, and the number of levels of cache memory.
- ii. The name and structure of the GPU and its number of levels of cache and their size.

**(10+10= 20 marks)**

## **Pricing Question (10 marks)**

Answer the following questions, noting the source of your pricing information:

- a) What is the best price (approximately) of this motherboard, from Australian computer shops/Ebay?

**(5+5) = 10 marks)**

## Part B Building a Recommended Platform Machine (78 marks)

### Gaming Computer (A Gamer's Rig)

If you are going to build a computer from scratch for a specific purpose, you will want to keep that purpose in mind when choosing your components; do not just go to the store or an online shop and start buying. Different configurations suit different purposes. The cost implications of choosing between these uses are huge. A cheap “work computer” might cost only two or three hundred dollars. A computer graphics designer’s workstation that can reach tens of thousands of dollars.

### Gaming computer (A Gamer's Rig)

Playing the latest video games places heavy demands on a computer, both in terms of graphics and processor performance. To ensure you have the best platform for your digital adventures you will need a machine that has a powerful graphics processing unit, fast internal storage, and a display that can keep up with everything that is going on in the game.

**Network device (router, cable, firewall) and network access (internet and intranet) are not in the scope of this assignment and the assumption is you have them set up already**

#### Task Description

1. (6x5= 30 marks) Fill out the following table— part model and price — for each of the categories.

**You must explain why you purchase each component.**

Please make **sure all combinations of parts are compatible.**

You may use any site you chose and must state this information in these tables. You may wish to provide screenshots of product store pages.

Feel free to extend the tables to include additional parts.

**Your aim is to build a system that is fit for purpose.**

#### Gamer's Rig Build

Parts	Model	Cost	Link
Motherboard			
CPU			
Memory			
Storage			
Graphics			
Display			
Total Cost			

2. (10 marks) Ensure that these main components **that you purchase pass the compatibility test** via e.g. <https://pcpartpicker.com/>



3. **(10 marks)** Install an appropriate RAID system explaining the reasons you have bought this configuration.
4. **(10 marks)** Install an appropriate cooling system explaining the reasons you have bought this configuration.

**Again, marks will be awarded based on how convincing the argument is and the use of relevant benchmark data.**

## Part C: Recent Technology (40 marks)

1. What are the differences between 3D NAND and 2D NAND memory? **(5+5 = 10 marks)**
2. Explain the difference between NVMe and M.2 **(5+5 = 10 marks)**
3. Give details of purchasing a 1TB NVMe/M.2. Details include the price and its specifications e.g. read/write speeds. You must also describe the type of flash memory e.g., SLC or MLC, eMLC, TLC, QLC etc. **( 10 marks)**
4. Give details of purchasing a 1TB SATA/M.2. Details include the price and its specifications e.g. read/write speeds. You must also describe the type of flash memory e.g., SLC or MLC, eMLC, TLC, QLC etc. **( 10 marks)**

## Part D Question 4 — Advanced Question (30 marks)

Virtual memory (30 marks)

In virtual memory, each program has a virtual address space. A page table is used to translate from virtual to physical memory address.

- a) (6 + 3 + 3+3= 15 marks) Explain the concept of virtual memory. Do you worry about if you are going to have enough virtual memory addresses (explain your answer)? Do you worry about if you are going to have enough physical addresses, or is there going to be any concern in terms of performance (explain your answer)?
- b) (5 + 10 marks) Assuming a cache miss, a data item is requested with its virtual memory address. Illustrate clearly how the corresponding page is located by using the page table directly. Explain if there are performance issues with the direct use of page table, and how the performance can be improved

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