25 multiple choice questions, Poster, Book discussion \*2

**Unit 1: Digital Information**

1. Be able to count in binary! (or convert decimal numbers to binary)

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| 1/0 | 1/0 | 1/0 | 1/0 | 1/0 | 1/0 |
| 24 | 23 | 22 | 21 | 20 | 2-1 |

1. Explain why binary was chosen as a method of communication in computing.

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| To make sense of complicated data, your computer has to encode it in binary. Binary is a base 2 number system. Base 2 means there are only two digits—1 and 0—which correspond to the on and off states your computer can understand. |

1. Describe how to represent fractions in the binary number system.

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| 1/0 | 1/0 | 1/0 | 1/0 | 1/0 | 1/0 |
| 24 | 23 | 22 | 21 | 20 | 2-1 |

1. Understand that overflow and round off errors result from real-world limitations in representing place value.

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| Digits are not enough bits to accurately represent a number.  Roundoff: not enough bit in the decimal place |

1. Understand the relationship between the powers of 2 and the number of bits needed to express a number of a certain magnitude. e.g. How many bits do I need to represent the number “15”, or “32”, or “1492”?

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| --- | --- | --- | --- | --- | --- |
| 1/0 | 1/0 | 1/0 | 1/0 | 1/0 | 1/0 |
| 24 | 23 | 22 | 21 | 20 | 2-1 |

1. Explain how bits are grouped to represent abstractions like numbers and text. (be able to use an ASCII table)

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| Table  Description automatically generated |

1. Explain how bits can be used to represent the individual pixels of a black and white image

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| 1. for black and 0 for white. |

1. Explain how bits can be used to represent the individual pixels of a color image

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| The number of bits used to represent the colours of pixels in a particular image is sometimes referred to as its "colour depth" or "bit depth". For example, an image or display with a colour depth of 8-bits has a choice of 256 colours for each pixel. |

1. Explain how sampling is used to create a digital form of an analog image

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| Sampling is the process of converting a signal (e.g., a function of continuous time or space) into a numeric sequence (a function of discrete time or space). The process is also called analog-to-digital conversion, or simply digitizing. |

1. Compare data compression algorithms to determine which is best in a particular context.

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| Lossy vs. Lossless  Oftentimes a 50% image compression will decrease the file size by 90%. If you aim to downsize your image file size beyond that, an 80% compression will only yield a 5% decrease, bringing your total reduction to 95%. |

1. Explain how copyright and Creative Commons Licenses can be applied to digital creative works.

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| Copyright: only author authorized persons can make change or spread etc. the content.  Commons Licenses: make change as long as you quote the authors. |

**Unit 2: The Internet**

1. Differentiate between a hierarchical and a distributed system, and the difference between closed and open protocols.

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| Hierarchical architectures are a type of distributed system in which the modules are organized into multiple control levels which operate at varying granularities, levels of abstraction, and time scales. (break when one chain break)  A distributed system is a computing environment in which various components are spread across multiple computers (or other computing devices) on a network. These devices split up the work, coordinating their efforts to complete the job more efficiently than if a single device had been responsible for the task. (Doesn’t change when others break) |

1. Describe the way the Internet Protocol helps uniquely identify one another on the internet.

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| Each device has an unique address to identify each other. |

1. Differentiate between IPv4 and IPv6, and explain why the system needed an update.

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| The main difference between IPv4 and IPv6 is the address size of IP addresses. The IPv4 is a 32-bit address, whereas IPv6 is a 128-bit hexadecimal address. IPv6 provides a large address space, and it contains a simple header as compared to IPv4.  IPv4 vs IPv6 | Basic difference between them along with the address format  - YouTube |

1. Describe the redundancy of routing between two points on the Internet and why it is beneficial.

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| The redundancy of routing (i.e., more than one way to route data) between two points on the Internet increases the reliability of the Internet and helps it scale to more devices and more people. |

1. Be able to identify the shortest route between two computers on the internet.

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| The shortest route is found by investigating a selection of routes from both the starting point and the terminal point. The selection of routes is decided dynamically by extending one by one the routes which have currently covered the least distance. |

1. Evaluate the benefits and security concerns associated with the use of a routed system of sending packets.

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| Takes the shortest route every time, decrease loading times.  Might be dropped, no control over time |

1. Explain how packet numbering and reordering can allow for large messages to reliably be sent even if packets are dropped or arrive out of order.

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| Not able to resend the lost information if the packets are not labeled. |

1. Explain how subdomains of a website are represented by DNS.

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| In the Domain Name System (DNS) hierarchy, a subdomain is a domain that is a part of another (main) domain. For example, if a domain offered an online store as part of their website example.com , it might use the subdomain shop.example.com . |

1. Give a few reasons why DNS is useful and necessary.

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| DNS is important because of its critical role as the backbone of the internet. If a DNS is not responding, you won't be able to connect to other websites on the internet. ... If the DNS cannot translate the domain name to the correct IP address, you won't be able to access any website |

1. Describe at least one vulnerability of DNS and how an attack on it works.

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| Cache poisoning – the attacker corrupts a DSN server by replacing a legitimate IP address in the server's cache with that of another, rogue address in order to redirect traffic to a malicious website, collect information or initiate another attack. Cache poisoning may also be referred to as DNS poisoning. |

1. Describe the difference between the internet and the World Wide Web.

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| The internet is millions of computers connect by thousands of networks while the world wide web is billions of pages that can be accessed through the internet. A collection of related web pages. |

1. Explain how different layers of protocols on the Internet build upon and rely on one another.

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1. Describe how a protocol or layer of the internet acts as an "abstraction" for other layers.

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| We often talk about how the Internet works in "layers" and this is a perfect example of abstraction on the Internet, as one layer makes use of the functionality provided by the layer below it, without worrying about the details of how this functionality is achieved. |

**Unit 1:**

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| Abstraction | A simplified representation of something that is more complex. |
| ASCII | American Standard Code for Information Interchange; the universally recognized raw text format that any computer can understand. |
| Hexadecimal | 1, 2,3,4,5,6,7,8,9,0,a,b,c,d,e,f🡺16 options |
| RGB | Red, Green, Blue |
| Binary | A way of representing information using only two options. |
| Analog | Non digital |
| Bit | "binary digit"; a single unit of information in a computer, typically represented by 0 or 1 |
| Byte | 8 bits |
| Protocol | A set of rules governing the exchange or transmission of data between devices. |
| Algorithm | a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer. |
| Heuristic | Approximate solution because the same step won’t always achieve the goal. |
| Lossy compression | a method of data compression in which the size of the file is reduced by eliminating data in the file. |
| Lossless compression | compression technique that does not lose any data in the compression process. Lossless compression “packs” data into a smaller file size by using a kind of internal shorthand to signify redundant data. |
| Sampling | process used in statistical analysis in which a predetermined number of observations are taken from a larger population. |
| Copyright | the exclusive legal right, given to an originator or an assignee to print, publish, perform, film, or record literary, artistic, or musical material, and to authorize others to do the same. |
| Creative Commons | Creative Commons licenses give everyone from individual creators to large institutions a standardized way to grant the public permission to use their creative work under copyright law. |
| Open Source | denoting software for which the original source code is made freely available and may be redistributed and modified. |
| Open Access | Open access (OA) refers to free, unrestricted online access to research outputs such as journal articles and books. OA content is open to all, with no access fees. There are two main routes to making research outputs openly accessible. |

**Unit 2:**

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| DNS | (Domain Name System) — The service that translates URLs to IP addresses |
| HTTP | Hyper Text Transfer Protocol - the protocol used for transmitting web pages over the Internet |
| IETF | Internet Engineering Task Force - develops and promotes voluntary Internet standards and protocols, in particular the standards that comprise the Internet protocol suite (TCP/IP). |
| Internet | A group of computers and servers that are connected to each other. |
| WWW | The World Wide Web (WWW) is combination of all resources and users on the Internet that are using the Hypertext Transfer Protocol (HTTP) |
| IP | Internet Protocol |
| IP Address | A number assigned to any device that is connected to the Internet. |
| Scalability | Scalability is the measure of a system's ability to increase or decrease in performance and cost in response to changes in application and system processing demands. |
| Net Neutrality | the principle that all Internet traffic should be treated equally by Internet Service Providers. |
| Network Redundancy | having multiple backups to ensure reliability during cases of high usage or failure |
| Fault tolerance | Fault tolerance is a process that enables an operating system to respond to a failure in hardware or software. This fault-tolerance definition refers to the system's ability to continue operating despite failures or malfunctions. |
| Packets | Small chunks of information that have been carefully formed from larger chunks of information. |
| Metadata | a set of data that describes and gives information about other data. (file size) |
| Bandwidth | a range of frequencies within a given band, in particular that used for transmitting a signal. |
| SSL/TLS | Transport Layer Security (TLS) is the successor protocol to SSL. TLS is an improved version of SSL(Secure Sockets Layer). It works in much the same way as the SSL, using encryption to protect the transfer of data and information. The two terms are often used interchangeably in the industry although SSL is still widely used. |
| Router | A type of computer that forwards data across a network |
| TCP | (Transmission Control Protocol) - provides reliable, ordered, and error-checked delivery of a stream of packets on the internet. TCP is tightly linked with IP and usually seen as TCP/IP in writing. |
| UDP | User Datagram Protocol (UDP) – a communications protocol that facilitates the exchange of messages between computing devices in a network. It's an alternative to the transmission control protocol (TCP). |
| URL | (Uniform Resource Locator) - an easy-to-remember address for calling a web page. |
| DDos attack | The DDoS attack will send multiple requests to the attacked web resource – with the aim of exceeding the website's capacity to handle multiple requests… and prevent the website from functioning correctly. |