

Programme Code: TU858, TU856
Module Code: CMPU 1022
CRN: 22386, 26443

TECHNOLOGICAL UNIVERSITY DUBLIN
KEVIN STREET CAMPUS

BSc. (Honours) Degree in Computer Science
BSc. (Honours) Degree in Computer Science (International)

Year 1

SAMPLE EXAMINATION PAPER 2020/21

Operating Systems 1

Jack O'Neill

DURATION: 3 HOURS

ANSWER **All** QUESTIONS

All questions carry equal marks.
A mark of 1% is awarded to each candidate who submits a paper

1. (a) *You can't hold firewalls and intrusion detection systems accountable. You can only hold people accountable.* (6 marks)
(Daryl White, Former C.I.O. of U.S. D.O.I.)

Operating Systems and applications provide some level of protection against computer security threats; however, the user must also take an active role. Describe, **in your own words**, what a computer user or administrator can do to help keep a computer protected against viruses, worms and trojans

- (b) System protection is multi-faceted, four protection methods include (12 marks)

1. Antivirus Software
2. Firewalls
3. Patch Management
4. Authentication

Describe, in your own words, the role each of the above plays (if any) in preventing DDOS attacks.

- (c) *A cryptographic system should be secure even if everything about the system, except the key, is public knowledge.*
(Auguste Kerckhoffs, Cryptographer)

Three can keep a secret, if two of them are dead.
(Benjamin Franklin, Former U.S. president)

- i. Sarah wants to send a sensitive document to Seán via email. Describe, in your own words, the potential security concerns faced by Sarah and Seán and how they can be addressed (6 marks)
- ii. Sarah and Seán have a choice between using Public-private-key (PPK)-based cryptography or password-based cryptography. Discuss the benefits and drawbacks of each, stating which you believe to be a more secure method and why (9 marks)

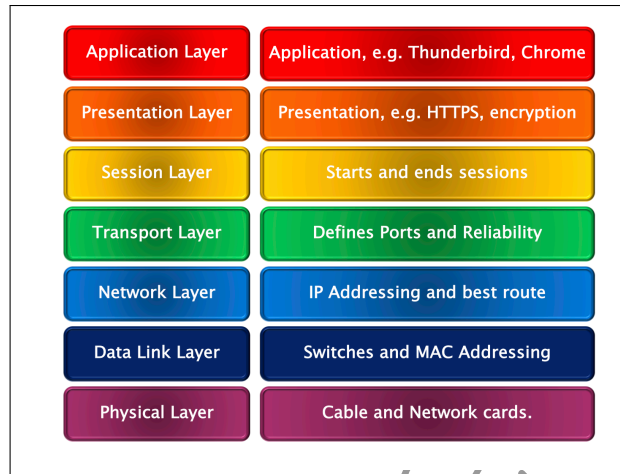


Figure 1: The Open Systems Interconnection (OSI) model

2. (a) A small telecommunications company, *BriteTalk* is designing a network topology to connect its customers to the internet. The company has a single large master server which handles all inbound and outbound traffic. *BriteTalk* has a number of smaller servers which can handle some, but not all of the expected traffic. Discuss a suitable network topology this company may choose to use. Explain the benefits and drawbacks (if any) of at least 2 network topologies as applicable to *this scenario* (12 marks)
- (b) i. You have been asked to manually set the IP address for a computer to communicate over your home network. For each of the following IP addresses, state whether or not they would be a suitable choice and why. (6 marks)
- a 174.28.55.102
 - b 127.0.0.1
 - c 192.168.0.55
- ii. You have been asked to manually set the IP address for a computer to communicate on a subnet with default gateway *192.168.5.1* and a subnet mask of *255.255.255.0*. For each of the following IP addresses, state whether it is valid and why. (6 marks)
- a 192.168.1.1
 - b 192.168.5.50
 - c 147.259.36.15
- (c) Figure 2 shows the different layers of the OSI model. When designing an email application, developers should not need to worry about the IP address of the server a machine is being sent to. (3 marks)
- i. Explain, with reference to Figure 2 why this is the case

- ii. Briefly discuss the benefits of using the OSI model when designing network-aware applications (6 marks)

Sample

3. (a) *In an extreme view, the world can be seen as only connections, nothing else* (9 marks)
(Tim Berners Lee, Inventor of the World Wide Web)
The earliest operating systems were designed for single computers, working alone without any connection to a network. Describe, in your own words, how the development of networking, and ultimately the world wide web, has impacted operating system design.
- (b) Explain the concept of *deadlock* in your own words. Give an example of how Deadlock can occur. What role does the Operating System play in helping to avoid problems of deadlock (9 marks)
- (c) i. Write a script which performs the following tasks (9 marks)
1. Writes a list of all files in the current directory to a file called **clearout.log** in the user's home directory
 2. Makes **clearout.log** read-only
 3. Makes a directory called *backups* in the user's home directory (only if it doesn't already exist)
 4. Moves all files in the current directory to the backup directory
- ii. Describe the steps you would take to ensure that the script is run every Monday at 11:00 pm. (6 marks)