Open University *of* Mauritius

BSc (HONS) COMPUTER SCIENCE [OUbs033]

EXAMINATION FOR: November - December 2022

MODULE : Networking Technologies [OUbs033212]

DATE : Friday 25 November 2022

DURATION : 2 Hours

INSTRUCTIONS TO CANDIDATES

1. This question paper consists of **FIVE (5) QUESTIONS**.
2. Answer **ANY FOUR (4) Questions**.
3. Always start a new question on a fresh page.
4. Total marks: **100**

This question paper contains 5 questions and 4 pages.

ANSWER ANY FOUR (4) QUESTIONS

QUESTION 1 [25 MARKS]

The OSI Reference Model (RM) is a collection of rules that application developers can utilize to construct and implement network applications. It also serves as a foundation for developing and deploying networking standards, devices, and internetworking schemes.

a) Briefly explain the functions of each layer of the OSI Reference Model.

(14 marks)

b) The Frame Check Sequence (FCS) is an important functionality in networking.

i. At which layer is FCS performed?

(1 mark)

ii. Describe how FCS works in the end to end delivery of data from a sender to a receiver.

(5 marks)

c) X.25 is a legacy suite of protocols used for packet switching. With the help of a diagram, describe the different devices in the X.25 protocol.

(5 marks)

QUESTION 2 [25 MARKS]

The domestic Fiber to the Home (FTTH) broadband internet connection involves the use of multi mode fiber links between an edge router in the core network of the ISP and Optical Network Terminals (ONT) in the household, which act as gateway.

a) Explain the differences between multi mode and single mode optical fiber links.

(6 marks)

b) Twisted pair and coaxial cables are two different types of medium which are also utilized in networks. Describe how each works and list **one (1)** application for each.

(8 marks)

c) In a typical household scenario, there are many requests coming from different devices to use the Internet. However, the ONT device, acting also as a NAT box is allocated a single public IP address.
Explain how does the NAT box know how to redirect these requests to their respective PCs.

(6 marks)

d) In addition to the IP protocol, the internet also uses other control protocols in the network layer. Two of these protocols are ICMP and DHCP. Briefly explain how each of them work.

(5 marks)

QUESTION 3 [25 MARKS]

a) Briefly describe the process of Stop-and-wait ARQ and Go Back N ARQ in detecting errors.

(8 marks)

b) Using a suitable example, differentiate between vertical redundancy check and longitudinal redundancy check.

(10 marks)

c) Some networking protocols are designed to optimise the routing of traffic when multiple stations are transmitting concurrently using the same communications channel. ALOHA is one such protocol designed to avoid collisions.

i. Explain how ALOHA works.

(3 marks)

ii. Using a suitable diagram, explain how SLOTTED ALOHA improves the transmission of information in shared channels.

(4 marks)

QUESTION 4 [25 MARKS]

a) In order to implement Wireless Networks, there are certain issues that have to be considered for the proper functioning and performance. Some of these issues are signal loss and fading, multipath distortion and shared airwaves.

Explain the impact of each of these in the performance of Wireless Networks.

(6 marks)

b) Briefly describe the key components in a Wireless Network.

(4 marks)

c) Carrier Sense Multiple Access (CSMA) was initially designed to work over wired networks involving simultaneous transmissions initiated by multiple stations.

Explain how CSMA works in Wireless Networks. **(5 marks)**

d) Buffering and Traffic Shaping are two key techniques to achieve a good Quality of Service (QoS) in networks. controlled to maintain a good QoS. Explain how these **two (2)** techniques work in the improvement of QoS, and provide **one (1)** application where each technique is particularly useful.

(10 marks)

QUESTION 5 [25 MARKS]

The Transmission Control Protocol/IP Protocol (TCP/IP) is the suite of protocol utilized for the Internet.

a) Describe the different layers in the TCP/IP Reference model.

(8 marks)

b) Transport Protocols include Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). Compare and contrast TCP and UDP.

(8 marks)

c) TCP Service Model includes the use of ports. What are ports?

(3 marks)

d) Routing protocols utilise algorithms to dictate how to route traffic. Two such algorithms are the '**Distance Vector Algorithm**' and '**Link state Algorithm**'. Explain how each work.

(6 marks)