UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

ACADEMY OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING	
MODULE	CSC02B2/CSC2B10 COMPUTER SCIENCE 2B
CAMPUS	AUCKLAND PARK CAMPUS (APK)
	JANUARY EXAM 2020

DATE: 2020-01	**SESSION:** 8:00 - 10:00
ASSESOR(S):	PROF D.T. VAN DER HAAR MS M. FOURIE MR T. MOODLEY
MODERATOR:	DR J.L. DU TOIT
DURATION: 120 MINUTES	**MARKS:** 100

Please read the following instructions carefully:

1. Answer **all** the questions
2. Write *cleanly* and *legibly*.
3. You may use a non-programmable calculator to answer the questions.
4. This paper consists of 5 pages (including this page).

QUESTION 1

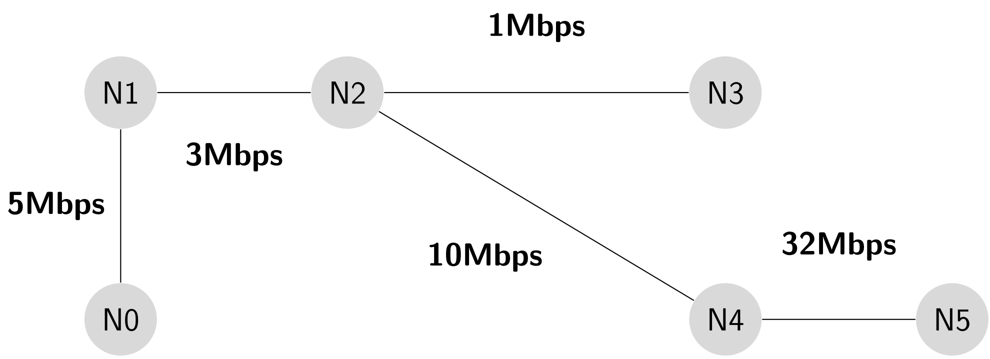
(a) Briefly describe *TDM* and how it works. [02]

(b) With the increase use of IoT, networks are faced with new vulnerabilities. *List* three (3) types of attacks that networks experience. [03]

Total: 5

QUESTION 2

Assume there is a copper network with 6 nodes (N0, N1, N2, N3, N4 and N5) and the transmission rates between these nodes are as follows:



It is also determined that the distances between the nodes are as follows:

- N0-N1: 10km
- N1-N2: 15km
- N2-N3: 25km
- N2-N4: 18km
- N4-N5: 5km

Answer the following questions:

(a) *Determine* the **approximate transmission rate** when communicating between N0 and N5. [01]

(b) Taking this **approximate transmission rate** into account, how *long* (in seconds) will it take to transfer a 16 MegaByte **file** from node N0 to N5? [02]

(c) If it is determined that the copper installed in this network **propagates** a signal at a speed of 60 000 km/s. *Calculate* the **propagation delay** for communications between N0 to N5. [03]

(d) Assuming that there is no nodal processing delay or queueing delay, *calculate* the **total time** taken to transfer a 16 MegaByte file from from N0 to N5? [04]

Total: 10

QUESTION 3

(a) *List* the steps that take place in the TCP three-way handshake. [03]

(b) *Discuss* circuit-switching, along with its advantages and disadvantages. [05]

(c) What does *IMAP* stand for? [01]

(d) What port *IMAP* run on? [01]

Total: 10

QUESTION 4

(a) *Briefly* describe four (4) services the transport layer provides. [04]

(b) *Discuss* how connection-less multiplexing occurs on the transport layer. [04]

(c) *Describe* for each of the following mechanisms, which problem they address in order to achieve reliability: [02]

- Timers
- Acknowledgments

Total: 10

QUESTION 5

The table below represents the payload of a UDP segment. Calculate the **sum** of the following two 16-bit integers, along with their associated 1s complement **checksum**:

Write down just the sum and checksum in your answer sheet

Number 1	1	0	0	1	1	0	1	0	0	1	1	1	0	0	1	0
Number 2	1	1	0	1	0	0	1	0	0	1	0	0	0	0	0	0

Total: 5

QUESTION 6

(a) *Illustrate* how a **IPv6 header** is structured and what makes it different from IPv4. [04]

(b) *Discuss* two (2) differences between the **Internet** (IP) and **ATM** (VC) network layer protocols, along with why you think IP is used more. [06]

Total: 10

QUESTION 7

Given the following **IP address** and **CIDR**, answer the questions that follow:

193.76.75.199/25

(a) Provide this address in **binary** notation. [02]

(b) How many hosts can this network **accommodate**? [02]

(c) Assuming classful addressing was used, what **class** does this address belong to? [02]

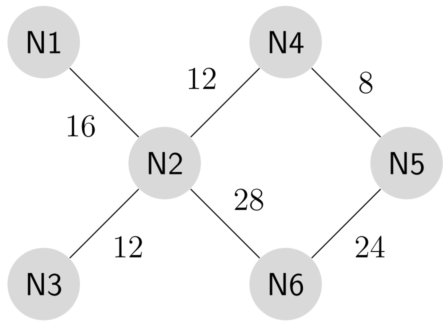
(d) Calculate the **network address** of this block in dotted decimal notation. [02]

(e) Calculate the **broadcast address** of this block in dotted decimal notation. [02]

Total: 10

QUESTION 8

Given the below network **routing graph** (with costs), answer the following questions that follow:



(a) What is the path with the **least cost** when communicating between N1 and N5. Is this the **only** cost effective path? [02]

(b) Given the local datagram **forwarding table** for node N2 below and the destination address is 196.83.37.91, which link will this packet be forwarded to? Please ensure to show all your calculations. [03]

Destination Address range	Output Link Interface
11000100 01010011 00100101 01011***	N1
11000100 01010011 00100101 010110**	N3
11000100 01010011 00100101 010111**	N4
Otherwise	N6

Total: 5

QUESTION 9

(a) *Name* and *describe* the three broad classes of MAC protocols within the context of the **data link layer**. [06]

(b) **Describe** two (2) techniques used for **error detection** at the **link** layer. [04]

Total: 10

QUESTION 10

(a) *Name* two (2) examples of permissions that are needed to create an Android application that communicates with a Java server and why you think permissions are needed. [03]

(b) *Describe* the use of the **tracert** network tool. [02]

Total: 5

QUESTION 11

Provide Java source code for a **UDP server** that runs on port 9876. When a message is received from a client, the server responds by sending an upper-case version of the message back to the client.

Total: 10

QUESTION 12

The code below illustrates a TCP client that receives a file which is then written to disk. Fill in the missing code in your answer booklet.

```
import java.io.*;
import java.net.*;

class TCPBinGet
{
  public void getfile(String address, int port, String filename,
      int length){
    File newFile = new File(________(a)________[1]);
    FileOutputStream fos = null;
    Socket fileSocket = null;
    try{
      fileSocket = new Socket(_______(b)_______[1], port);
      InputStream is = _________(c)____________[1];
      fos = new FileOutputStream(newFile);
      byte[] buffer = new byte[512];
      int n = 0;
      int totalBytes = 0;
      while (________(d)___________[2])
      {
        n = _________(e)____________[2];
        fos.write(buffer, 0, n);
        fos.flush();
        totalBytes += n;
      }
    }
    catch (________(f)__________[1]) { ex.printStackTrace(); }
    catch (IOException ex) { ex.printStackTrace(); }
    finally{
      if(fileSocket!=null){
        try { _______(g)_________[1]; }
        catch (IOException e) { e.printStackTrace(); }
      }
      if (fos != null){
        try { _______(h)________[1]; }
        catch (IOException e) { e.printStackTrace(); }
      }
    }
  }
}
```

Total: 10

The End!