NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION: BACHELOR OF COMPUTER SCIENCE	
QUALIFICATION CODE: 07BACS	**LEVEL: 7**
COURSE: Network Design and Performance	**COURSE CODE: NDP710S**
DATE: July 2019	
DURATION: 2 hours	**MARKS: 50**

SECOND OPPORTUNITY / SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER(S)	**Mr Peter Gallert**
MODERATOR:	**Mr Baruani Atumbe**

THIS QUESTION PAPER CONSISTS OF 2 PAGES
(Excluding this front page)

INSTRUCTIONS

1. Answer all questions.
2. When answering questions you should be led by the allocation of marks.
3. Do not use or bring into the examination venue books, mobile devices and other material that may provide you with unfair advantage. Should you be in possession of one right now, draw the attention of the examination officer or invigilator.
4. NUST's examination rules and regulations apply.

PERMISSIBLE MATERIALS
Calculator is allowed.

1. Briefly describe the following terms:
   (a) Application requirement (2)
   (b) Tail drop (2)

2. A workstation uses the HTTP protocol to download a large file from a web server. The layer–4 protocol for this file exchange is TCP. No proxy server is used. One router's queue is full when one of the web server's packets arrives. Consider the actions that follow, with respect to the HTTP protocol **and** the TCP protocol.
   (a) What action will the router take? (1)
   (b) What action will the workstation take? (1)
   (c) What action will the web server take? Consider two actions. (2)

3. Briefly describe the difference between *full–duplex* and *half–duplex* data transmission (2 marks), and give one sample network technology each that uses them (1 mark each). (4)

4. Company X has saved their business data on two replicating database servers. They secure these servers in a reinforced basement with steel doors, an electronic card access system, CCTV, and 24–hour armed guards. (5)

   Critically comment: Does it make sense to invest such vast amounts of money to secure two computers with a combined value of just about 100,000 N$?

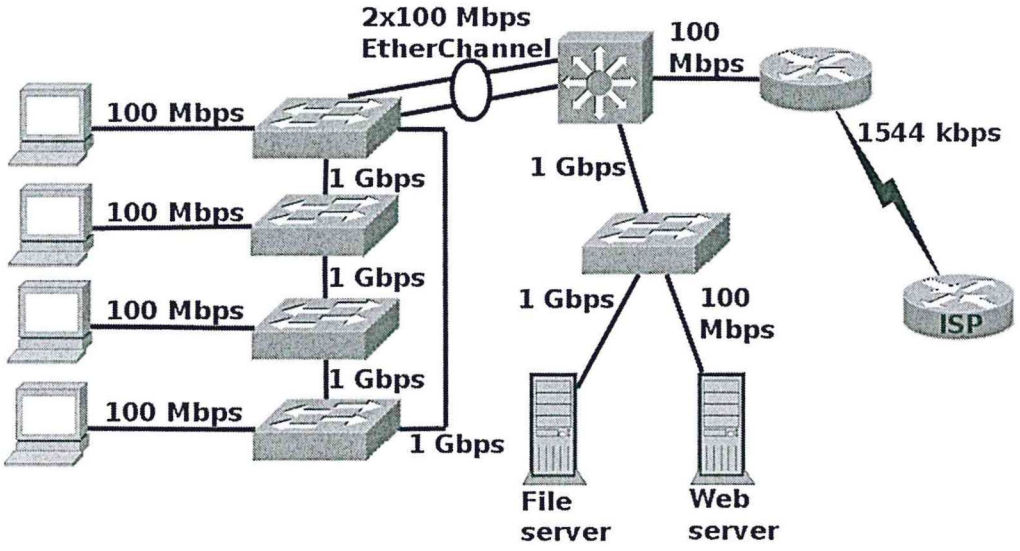
5. The following packets have arrived at a router, in the order given as "Packet #" below. The data units to 2.0.0.7 are HTTP traffic, the data units to 3.0.0.10 are an extended DNS query, and the data units to 100.0.0.5 are part of a VoIP phone call.

   All data units will exit interface Serial0/0/0, where the scheduling discipline is Flow–based Fair Queueing.

Packet #	Source IP	Dest. IP	Protocol	Source port	Dest. port	Bytes
1	10.0.0.6	2.0.0.7	TCP	65001	80	695
2	10.0.0.6	2.0.0.7	TCP	65001	80	113
3	10.0.0.6	100.0.0.5	UDP	65002	1026	84
4	10.0.0.2	3.0.0.10	UDP	65003	53	64
5	10.0.0.6	100.0.0.5	UDP	65002	1026	84
6	10.0.0.2	3.0.0.10	TCP	65003	53	895
7	10.0.0.6	100.0.0.5	UDP	65002	1026	84

   (a) Indicate how many queues will be formed for these packets, and which packet is in which queue, in which order. (5)
   (b) In which order are the packets sent out of interface Serial0/0/0? (7)

6. Consider the following network topology. Each workstation on the left represents 20 user PCs. All switches are Cisco 2950 (24 ports of 100 Mbps plus 2 ports of 1 Gbps). Only the multi–layer switch (MLS) does traffic policing in this network. The web server can be accessed from the outside, while the file server cannot.



(a) Why is the link between switch block and MLS not a Gigabit link? Explain in some detail. (4)

(b) One user intends to save a local backup file on the file server. Briefly describe best–case scenario and worst–case scenario of network performance. (2)

(c) Identify the bottleneck in this network when saving local backup files on the file server, in the best–case scenario, and in the worst–case scenario of network performance. (2)

(d) Calculate the usable net bit rate when saving local backup files on the file server, in the best–case scenario, and in the worst–case scenario of network usage. (3)

(e) Which interfaces of the MLS require an `IP` address? List the interfaces, and explain briefly for each of them why an `IP` address is necessary. (6)

(f) The network is supposed to be expanded by 4 access points to provide wireless network access *for employees*. Briefly describe (or draw in your answer sheet) where these access points would be connected. (2)

(g) The network is supposed to be expanded by 4 access points to provide wireless network access *to visitors*. Briefly describe (or draw in your answer sheet) where these access points would be connected. (2)

End of question paper