NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Computing and Informatics

Department of Computer Science

QUALIFICATION: BACHELOR OF COMPUTER SCIENCE, BACHELOR OF COMPUTER SCIENCE IN CYBER SECURITY, BACHELOR OF ENGINEERING: ELEC. & TELECOM	
QUALIFICATION CODE: 07BACS, 07BCCS, 35BEET	**LEVEL: 6**
COURSE: Communication Networks	**COURSE CODE: CMN620S**
DATE: January 2020	
DURATION: 2 hours	**MARKS: 50**

SUPPLEMENTARY / SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	**Peter Gallert**
MODERATOR:	**Prof Dharm Singh Jat**

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) Write clearly and neatly in your examination book. Answers that appear only on the question paper **cannot be marked**.

PERMISSIBLE MATERIALS

1) Calculators are **not allowed!**
2) 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 such material right now, draw the attention of the examination officer or invigilator.

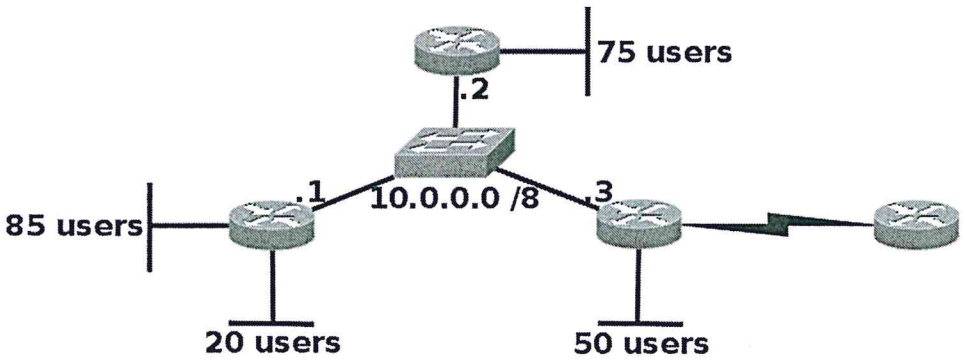
1. A pizza baker in Windhoek plans to expand business by accepting Internet orders. They ask you to design their small network. The following devices need to be accommodated:

   - 10 user PCs
   - Web server to enable Internet orders and payment
   - Email server to enable further communication with customers
   - Print server to print accepted orders for the bakery

   (a) Design a simple network for the pizza bakery, using no more than 2 routers and 3 switches. Place the devices listed above accordingly (the ten PCs can be *one* symbol). Indicate which device to connect to the Internet. (6)

   (b) The service provider has allocated the small public IP address block `196.1.1.0 /28` to the bakery. Internally, private IP addresses should be used. Indicate the IP addressing for your network. (4)

2. Consider the network below. The routers run `OSPF`, the LAN interconnecting the routers already has `IP` addresses from network `10.0.0.0 /8`, as indicated. The physical LAN with 75 users is logically divided into three VLANs: VLAN 2 (Admin) with 25 users, VLAN 3 (Reception) with 45 users, and VLAN 4 (IT) with 5 users.



   (a) Provide `IP` addresses for **all subnets except the** `10.0.0.0 /8` **LAN**, using the private `IP` address block `192.168.0.0 /16`. Subnet according to Variable–Length Subnet Masking (VLSM) principles. Provide your answer on the answer sheet, not on the question paper, using clear network names like "LAN 85" and "Admin VLAN". (12)

   (b) If the routers were running `RIPv1` as routing protocol instead of `OSPF`, how would the `IP` addressing have to change? (6)

      (i) In general—What would need to be considered to make this change? [2 marks]

      (ii) Why would a change to the existing `IP` addressing be necessary? [2 marks]

      (iii) Give an example of how `LAN 50` could be supplied with `IP` addresses in this case. [2 marks]

3. Explain the operation of a router in terms of the OSI model of computer networking.
   (a) On which layers of the OSI model does a router operate, and what are its responsibilities per layer? (4)
   (b) What types of encapsulation and decapsulation does a router perform, and why? (4)

4. A router has a Loopback interface with an IP address of 105.105.105.105 /16.
   (a) What is the command on the router to enable routing for this Loopback (4)
      (i) ...when running the Routing Information Protocol (RIP)? (2 marks)
      (ii) ...when running Open Shortest Path First (OSPF)? (2 marks)
   (b) After the Loopback network has been correctly configured, what information about this Loopback will be sent to other routers? (4)
      (i) ...when running the Routing Information Protocol (RIP)? (2 marks)
      (ii) ...when running Open Shortest Path First (OSPF)? (2 marks)
   (c) After the network has converged, which routing protocol data will be sent out via the Loopback interface? (2)
      (i) ...when running the Routing Information Protocol (RIP)? (1 mark)
      (ii) ...when running Open Shortest Path First (OSPF)? (1 mark)

5. Which network design goals are supported by the following actions? Mention one goal per action, and explain briefly.
   (a) Installing a second power supply into each of the public servers (2)
   (b) Using a proxy server for `HTTP` and `FTP` (2)

End of question paper