

THE UNIVERSITY OF ZAMBIA
END OF YEAR EXAMINATIONS: OCTOBER / NOVEMBER, 2022
ICT 4010: DATA AND COMMUNICATION NETWORKS

Instructions:

- This examination paper consists of a total of four (4) questions and three (3) pages.
- Answer all questions from **Section A** and any two (2) questions from **Section B**.

Marks: 80

Time: Three (3) hours

SECTION A (COMPULSORY) 30 MARKS

Question 1 [30 marks]

- a) A university has 80 LANs with 150 hosts in each LAN. Suppose the university has one class B IP-address:
- i. Using subnetting, give the university a suitable class B IP-address and a subnet mask which can accommodate the 80 LANs [4]
 - ii. List the network addresses and the broadcast addresses of the first 4 subnets [5]
(*Show your working*)
- b) Regarding network topologies
- i. Explain the difference between a ring topology, a star topology and a tree topology. Additionally, give one disadvantage for each of the three topologies [6]
 - ii. Explain two advantages and two disadvantages of a bus topology [4]
- c) Regarding the OSI Model:
- i. Explain three functions of Layer 2 [3]
 - ii. Describe check-pointing and adjournment regarding Layer 5 [4]
- d) Explain any four factors that affect cable attenuation [4]

SECTION B (ANSWER ANY TWO QUESTIONS) 25 MARKS EACH

Question 2 [25 marks]

- a) Ethernet technology uses a CDMA-CD or CDMA-CA algorithm to manage collisions. Explain the difference between the two modes of operation. [4]
- b) Regarding MAN technologies:
- i. Explain one advantage and one disadvantage of SONET [2]
 - ii. Explain one advantage and one disadvantage of ATM [2]
 - iii. Explain two advantages that Gigabit Ethernet has over SONET and ATM [2]

c) Given the following network illustration:

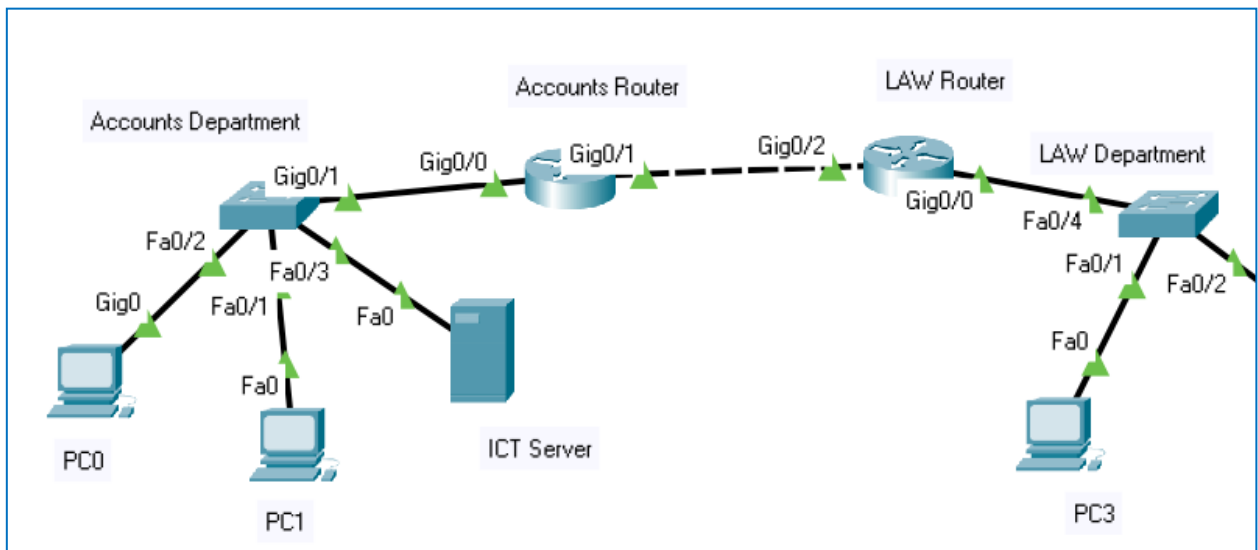


Figure 1 – An illustration of small LANs

Suppose the Accounts Router and the LAW Router have been physically connected via Ethernet cables, however these two routers have not yet been configured. The Accounts Department uses the network address 192.168.10.0 / 26 and the LAW Department uses the network address 172.16.1.0 / 18. For each of the two routers: give the router suitable **IP addresses** and write all the **router commands** that can be used such that PC1 can have network connectivity with PC3, whereby packets can be successfully sent from PC1 to PC3. [12]

d) Explain the difference between bandwidth and throughput. Additionally, include an illustration of bandwidth and throughput. [3]

Question 3 [25 marks]

a) Bank BBZ has 3 LANs with 50 hosts in the 1st LAN, 25 hosts in the 2nd LAN and 7 hosts in the 3rd LAN. Suppose the company uses only one class C address. Using subnetting and a Variable Length Subnet Mask (VLSM), for each of the 3 LANs: give a suitable network address and a subnet mask. (*Show your working*) [10]

b) Regarding network devices:

- i. Explain the difference between a hub and a router [2]
- ii. Explain two differences between a switch and a bridge [4]

c) Regarding routers:

- i. Explain the difference between “Distance vector” and “Link state” protocols. [4]
- ii. Give the name of one distance vector protocol and give the name of one Link state protocol [2]

- d) In the OSI Model, give the name and function of Layer 3. Additionally, give the name of the TCP/IP Model's Layer 3. [3]

Question 4 [25 marks]

- a) Explain any two ways in which Denial of Service attacks can be countered on a network [4]
- b) Besides viruses and worms, explain any two types of malware [2]
- c) Regarding network cables:
- i. Explain the difference between CAT 6 and 10Base5 cables [2]
 - ii. Explain the difference between 100Base-TX and 100Base-FX cables [2]
- d) Explain two differences between a MAC address and an IP Address. Additionally, give an example of a hexadecimal format MAC address. [5]
- e) Suppose PC1 is connected to Switch1 via the Fa0/5 interface. Write all the **switch commands** that can be used to set PC1 into VLAN 20 [4]
- f) Regarding collision detection: explain how exponential backoff works. [3]
- g) Explain one advantage and two disadvantages of Ethernet [3]

— END OF EXAMINATION —