

THE UNIVERSITY OF ZAMBIA
END OF YEAR EXAMINATIONS: NOVEMBER, 2021 (*Past Paper*)
ICT 4010: DATA AND COMMUNICATION NETWORKS

INSTRUCTIONS:

Answer Three (3) Questions

Answer **one (1)** compulsory question from **Section A** and **any two (2)** questions from **Section B**
Total marks: 80

Time: Three (3) Hours

SECTION A (COMPULSORY) 30 MARKS

Question 1 [30 marks]

- a) Regarding network topologies:
- i. Explain the difference between physical topologies and logical topologies [2]
 - ii. Give the difference between a logical bus topology and a logical ring topology [2]
 - iii. Give three physical topologies, for each: indicate the topology name and a description of the topology [6]
- b) Regarding the OSI model, name the data units associated with Layer 3 and Layer 4 of the OSI model additionally explain the difference between these data units. [4]
- c) You have been given the network address **194.160.10.0 /28**, to create suitable subnets: (*show your working for sub-question i to iii below*)
- i. How many subnets can there be in total [3]
 - ii. How many usable host addresses are available in each subnet [3]
 - iii. What will be the network address of subnet #3 [2]
 - iv. How many host bits will be *borrowed bits* needed for the subnets [2]
 - v. Indicate the subnet mask of the given network address [2]
- d) Explain the difference between guided media and unguided media. Additionally, give one example of guided media and one example of unguided media. [4]

SECTION B (ANSWER ANY TWO QUESTIONS) 25 MARKS EACH

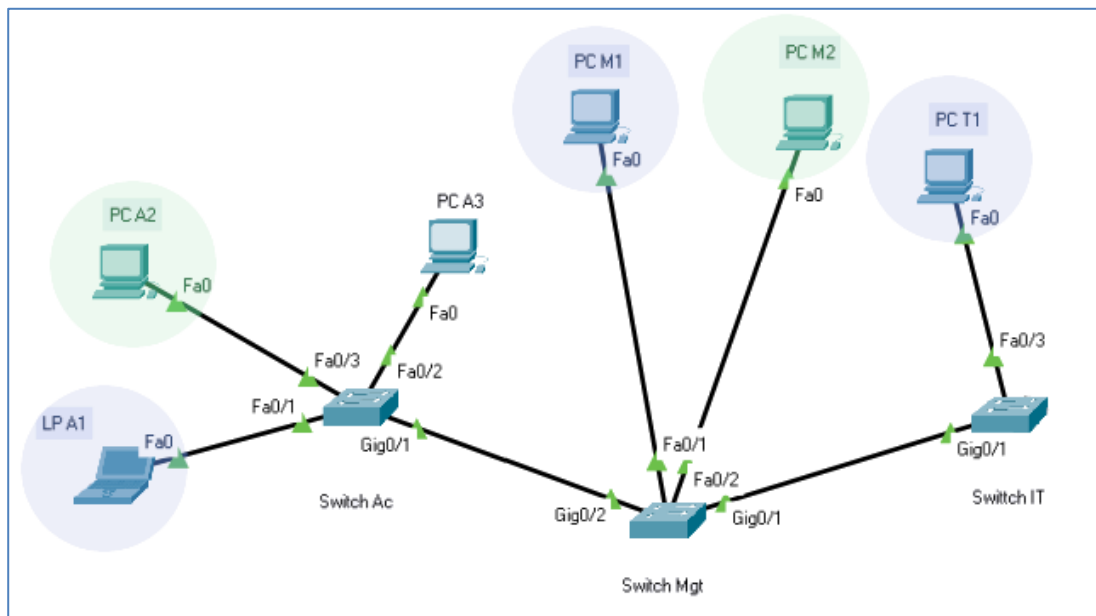
Question 2 [25 marks]

- a) Regarding IP addresses:
- i. Explain two differences IPv6 has compared to IPv4 [2]
 - ii. Explain two advantages IPv4 has over IPv6 [2]
 - iii. Give the difference between static assignment and dynamic assignment. Furthermore give a scenario whereby static assignment would be suitable for a network device [3]

- b) UTP cables have been used for network connections since the 1980s:
- i. Explain the difference between UTP and STP cables [2]
 - ii. Give one difference and one similarity between 10Base2 and 10Base5 cables [2]
 - iii. Explain one similarity that CAT 6 cables have with CAT 5 cables [1]
 - iv. What is the function of a crossover cable and what is the function of a straight-through cable [2]
 - v. Indicate the eight colored wire-pairs in a T568 B straight-through cable (in order, from wire-pair 1 to wire-pair 8) [2]
- c) Explain what the following router commands are used for: [5]
- i. hostname
 - ii. interface
 - iii. no shutdown
 - iv. exit
 - v. ip ospf
- d) Name two network simulation tools and give two advantages of network simulators [4]

Question 3 [25 marks]

- a) Given the following network illustration (including interface names): write all the Switch commands for *Switch Ac* and *Switch IT* such that:
- i. The devices **LP A1** and **PC T1** should be on the same VLAN named VLAN 25 [8]
 - ii. Give a command that will show more VLAN information on *Switch IT* [2]



- b) Which layer of the OSI model is equivalent to the Internet Layer of the TCP/IP model. Additionally give the function of the given layer in the OSI model. [3]
- c) Which networking devices are associated to Layer 2 and Layer 3 of the OSI model [2]
- d) Give 5 layers of the OSI Model; give the layer name, layer number and function for each of the 5 layers given. [10]

Question 4 [25 marks]

- BZM Bank has 9 LANs with 50 hosts in each LAN. Suppose the company uses only one class C address. Using Subnetting: Give the bank a **class C address** and list the first 5 subnet **network addresses** and the first 5 **broadcast addresses** that BZM Bank can use. [8]
(Show your working)
- Explain the difference between Class B and Class C IPv4 addresses [2]
- Explain the problem of IPv4 which IPv6 solves [2]
- Give the range of IPv4 Class B networks [2]
- Besides geographical size, explain two classification-type of computer networks [2]
- Explain the function of Link Layer in TCP/IP [3]
- Explain the difference between bandwidth and throughput, include a diagram to illustrate the difference between bandwidth and throughput [3]
- Give the difference between a collision domain and a broadcast domain [2]
- Regarding network cables, what is attenuation. [1]

(Edited – Additional Question)

Given the following network illustration:

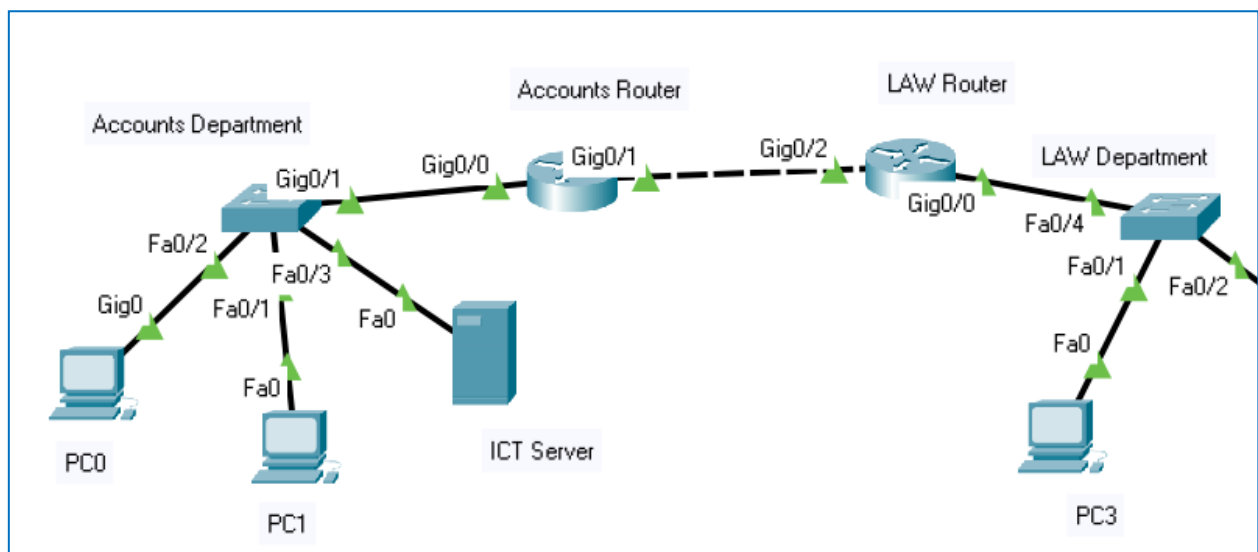


Figure 1 – An illustration of small LANs

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]