Semester 1 Examinations 2019/2020

Exam Code(s)	3BCT
Exam(s)	Third Year Computer Science & Information Technology
Module Code(s)	CT3531
Module(s)	Networks and Data Communications 2
Paper No.	1
External Examiner(s)	Dr. J. Howe
Internal Examiner(s)	Prof. M. Madden
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Instructions: Answer any 4 questions.
All questions carry equal marks.

Duration	2 hrs
No. of Pages	5
Discipline(s)	Computer Science
Course Co-Ordinator	Dr. D. Chambers

Requirements:

Release in Exam Venue	Yes	X	No	
MCQ Answersheet	Yes		No	X
Handout	None			
Statistical/ Log Tables	None			
Cambridge Tables	None			
Graph Paper	None			
Log Graph Paper	None			
Other Materials	None			
Graphic material in colour	Yes	X	No	

PTO

Question 1

a) In the context of Local Area Networks (LANs) explain briefly what is meant by the term "broadcast traffic" and provide an example of when this type of traffic will occur. 5 MARKS

b) Describe the basic function and advantages of using Virtual LANs (VLANs). How is the traffic between different VLANs handled? 5 MARKS

c) How is VLAN membership decided in relation to determining and controlling which VLAN a packet gets assigned to? 5 MARKS

d) How do network switches demultiplex traffic from different VLANS in a situation where VLANs span multiple switches? 5 MARKS

e) Explain briefly the purpose and operation of the Spanning Tree Protocol. 5 MARKS

Question 2

Assume that you are working for a large corporation that wants to use the private IP address range starting at 10.0.0.0/8 for its internal network. The company management wants to be able to have up to 256 separate sites globally with a routed subnet for each site. You are requested to design the network layout. Answer the following questions and fully explain the logic behind each answer:

a) What subnet mask will need to be used for the individual routed subnets? 5 MARKS

b) How many host IP addresses are available in each of the 256 sites? 4 MARKS

c) What are the valid host addresses and the broadcast addresses for the first and second subnets? 5 MARKS

d) Would it be possible for each of the 256 sites to further subnet the IP range allocated to them? Explain your answer with an example. 5 MARKS

e) What is the purpose of using a Network Address Translation (NAT) router? Does using a NAT router enhance or decrease security for an internal network? Explain the logic behind your answer. 6 MARKS

Question 3

a) Explain the purpose of the ***mtr*** utility and what it typically shows. 4 MARKS

b) Who is responsible for allocating public IP addresses in Europe? Explain briefly the purpose and implementation of the so-called "Last /8 Policy". 3 MARKS

c) Describe briefly each of the following: Private Network Interconnect, IP Transit Provider, Default Free Zone 6 MARKS

d) What are the key parameters that are required for a Border Gateway Protocol (BGP) peering session? Give an example of how a BGP peering session might be configured on a Mikrotik Router. 6 MARKS

e) Explain the use of the Local Preference Multi-Exit Discriminator attributes in BGP. How would you scale the peering requirements of a large BGP deployment in an Internet Exchange Point (IXP)? 6 MARKS

Question 4

a) Describe briefly the purpose of a Virtual Private Network and give some examples of the protocols that can be used to implement a VPN. 5 MARKS

b) In the context of network security what does the term "stateful firewall" mean and how is it typically used to protect a network? 5 MARKS

c) Give an example of an Intrusion Detection System (IDS) and list the kind of features that it implements. Are there any disadvantages to using an IDS? 5 MARKS

d) Outline briefly the three main functions provided by a Packet Filter in Linux. Which firewall chain is used in IPTABLES for packets that are destined for a local process running on the device itself? 5 MARKS

e) What type of firewall features are included in Mikrotik RouterOS? 5 MARKS

Question 5 Consider the example network shown in Figure 1 below:

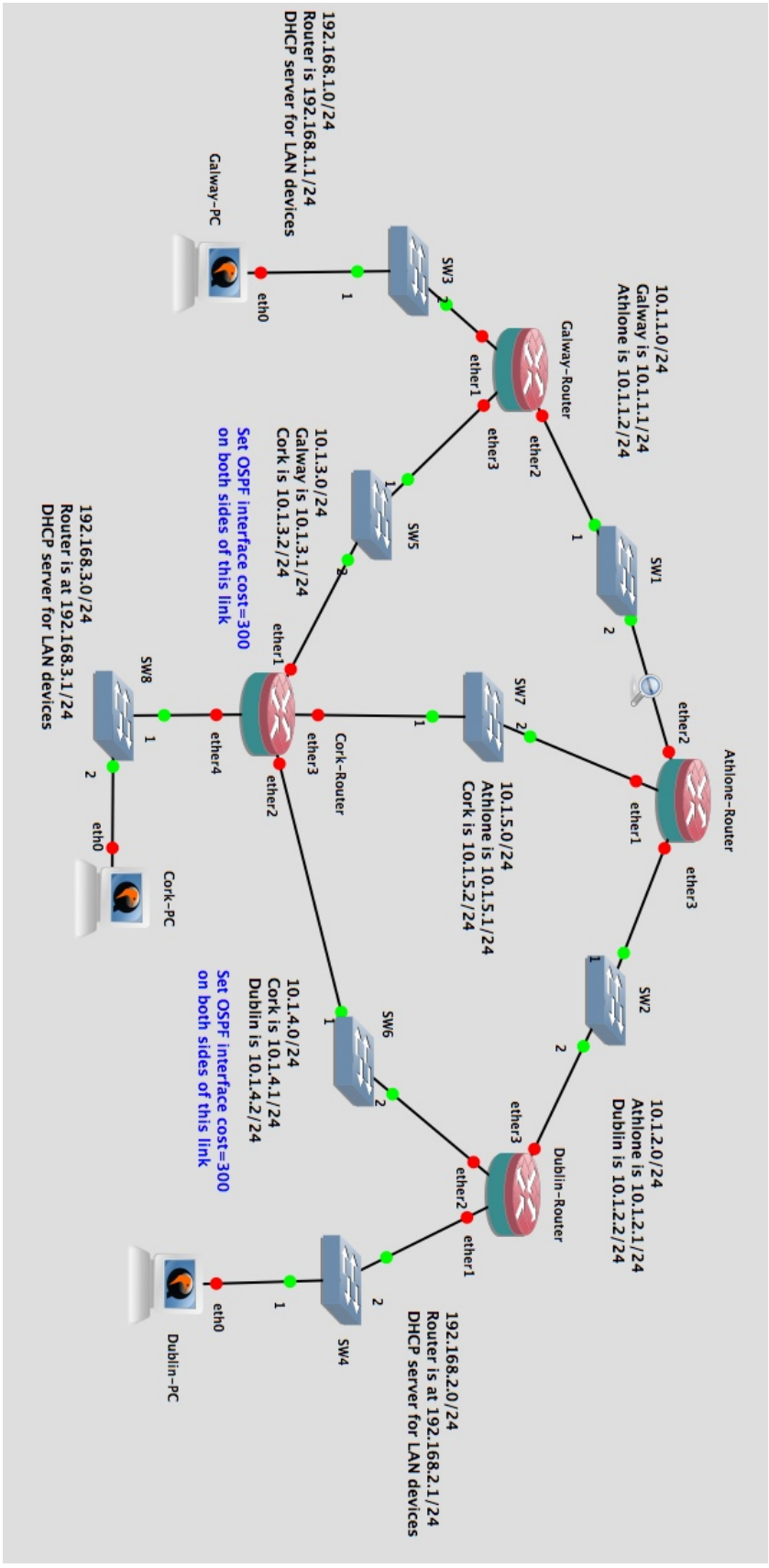

Figure 1 - Example Network

Answer the following questions in relation to this network:

a) Describe the operation and purpose of the OSPF protocol in the network shown. What is the Link State Database and how is Dijkstra's Algorithm used by OSPF in this context? 5 MARKS

b) Describe the format of an OSPF Link State Announcement. Explain how a Link State Announcement from the Galway router would be disseminated throughout the network? 6 MARKS

c) What route will a PC attached to the Dublin router normally take to get to the Galway router? What would happen with OSPF if the link between the Galway and Athlone became unavailable for some reason? 5 MARKS

d) Suppose a company was using the RIP dynamic routing protocol on its routers, what reasons would you give to persuade them to change to OSPF instead? In this context explain the difference between Distance Vector and Link State routing. 5 MARKS

e) Assume that the routers are running Mikrotik RouterOS. The Galway, Cork and Dublin routers need to be setup as DHCP Servers for the local network with the host device. What configuration commands are required to enable this feature on a Mikrotik router? 4 MARKS