



Autumn Examinations 2017

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. Power
Internal Examiner(s)	Dr.. M. Schukat *Dr. D. Chambers

Instructions: Answer any 4 questions.
All questions carry equal marks.

Duration	2 hrs
No. of Pages	5
Department(s)	Information Technology
Requirements	None

Question 1

- a) What are the main phases of network design as per the top-down network design approach? 5 MARKS
- b) What are some typical technical goals for organizations today when undertaking network design? 5 MARKS
- c) How is Availability typically measured or expressed? How might it be possible to achieve “Five Nines” in this context? 5 MARKS
- d) When considering protocol behavior, what is the difference between relative network utilization and absolute network utilization? 5 MARKS
- e) What architectural and environmental factors should you consider for a new wireless installation? 5 MARKS

Question 2

Assume that you are working for a large corporation that is using the private IP address range 172.16.0.0/16 for its internal network. The company management wants to be able to accommodate at least 30 departments with a maximum number of 2000 hosts per department. 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? 5 MARKS
- b) What is the maximum number of subnets that the company network can accommodate given that there are at least 2000 hosts per subnet? 5 MARKS
- c) What are the valid host addresses on the first and last subnets? 5 MARKS
- d) What other private IP ranges could the company use if needed? 5 MARKS
- e) When is it appropriate to use IP private addressing versus public addressing? 5 MARKS

Question 3

- a) When is it appropriate to use static versus dynamic addressing?
4 MARKS
- b) List and describe six different types of traffic flows. 6 MARKS
- c) Why should you be concerned about broadcast traffic? 5 MARKS
- d) How do IETF specifications for QoS affect different types of network traffic?
5 MARKS
- e) What are the advantages and disadvantages of the various options for multi-homing an Internet connection?
5 MARKS

Question 4

- a) How does a security plan differ from a security policy and why is it important to achieve buy-in from users, managers, and technical staff for the security policy?
6 MARKS
- b) What are some methods for keeping hackers from viewing and changing router and switch configuration information? How can a network manager secure a wireless network?
7 MARKS
- c) Outline briefly the three main functions provided by a Packet Filter in Linux. Which firewall chain is used in IPTABLES for packets that are NOT destined for a local process running on the device itself? Explain in detail the purpose of the following two firewall rules that are defined using IPTABLES format:

```
iptables -A INPUT -p tcp --syn -j DROP
```

```
iptables -A PREROUTING -t nat -p icmp -d 137.189.89.176 \  
-j DNAT --to 137.189.89.178
```

12 MARKS

Question 5

Consider the example network shown in Figure 1 below:

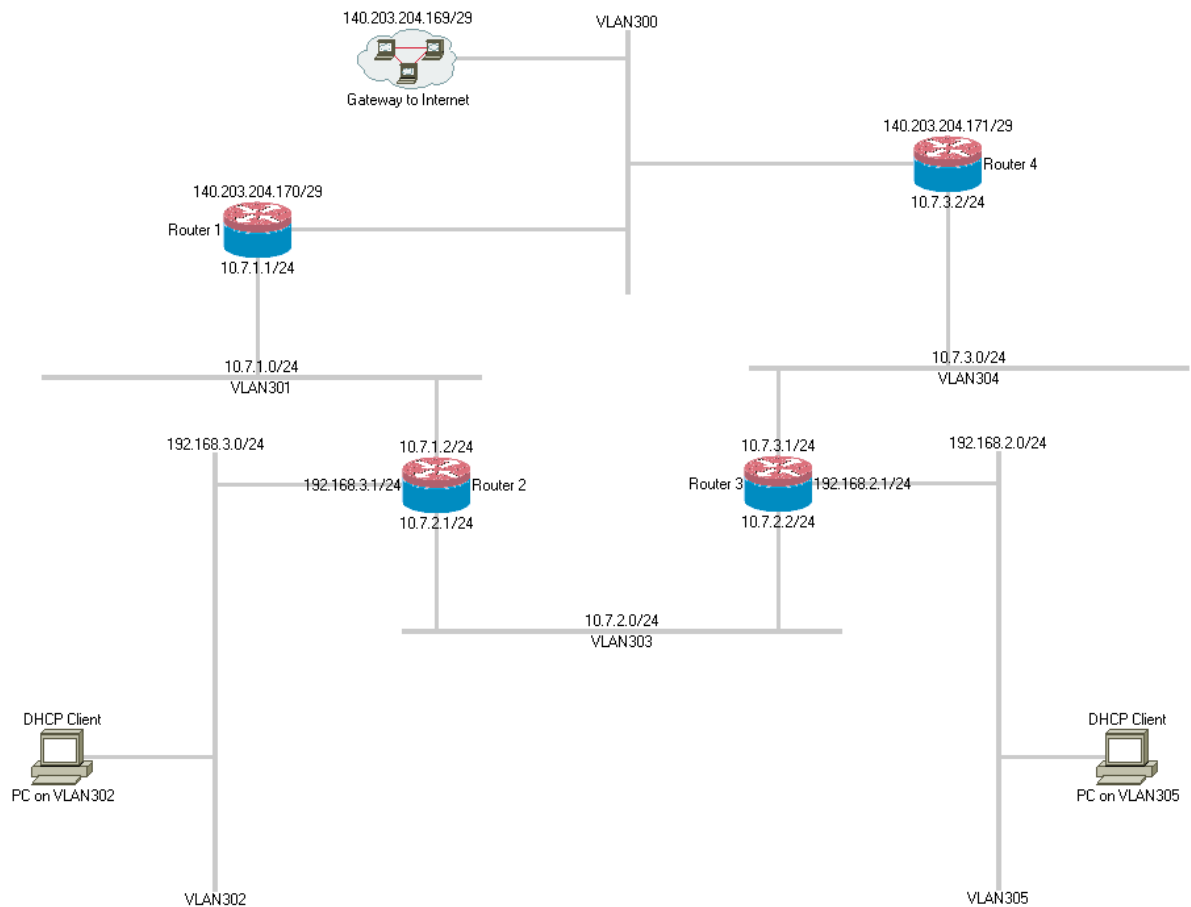


Figure 1 - Example Network

Router 1 has two connected interfaces with the IP addresses shown in Figure 1. It has a NAT firewall rule for internal traffic routed to the internet via this router, as well as a default route to the internet via gateway 140.203.204.169. It has OSPF enabled on the interface connected to Router 2 and it redistributes its default route to other routers via OSPF. The OSPF cost of the interface linking to Router 2 uses the default value of 10.

Router 2 has three connected interfaces with the IP addresses shown in Figure 1. It acts as a DHCP Server for subnet 192.168.3.0/24 and has OSPF enabled on the interfaces connected to Router 1 and Router 3. It also redistributes connected networks so that other OSPF routers will have a route for the 192.168.3.0/24 subnet. The OSPF cost of the interfaces linking to Router 1 and Router 2 both use the default value of 10.

[Q5 continued overleaf]

Router 3 has three connected interfaces with the IP addresses shown in Figure 1. It acts as a DHCP Server for subnet 192.168.2.0/24 and has OSPF enabled on the interfaces connected to Router 2 and Router 4. It also redistributes connected networks so that other OSPF routers will have a route for the 192.168.2.0/24 subnet. The OSPF cost of the interfaces linking to Router 2 uses the default value of 10. However, the OSPF cost on the interface connecting to Router 4 has been set to 300.

Router 4 has two connected interfaces with the IP addresses shown in Figure 1. It has a NAT firewall rule for internal traffic routed to the internet via this router, as well as a default route to the internet via gateway 140.203.204.169. It has OSPF enabled on the interface connected to Router 3 and it redistributes its default route to other routers via OSPF. The OSPF cost on the interface linking to Router 3 has been set to 300.

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?
8 MARKS
- b: What route will a PC attached to VLAN302 and VLAN305 normally take to get to the internet? What would happen with OSPF if the interface between Router 1 and Router 2 became unavailable for some reason? How would the resulting Link State Announcements be disseminated throughout the network?
7 MARKS
- c: What is an Autonomous System? In this context explain the purpose of the Border Gateway Protocol (BGP).
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?
5 MARKS