UNIVERSITI TUNKU ABDUL RAHMAN

ACADEMIC YEAR 2023/2024

SEPTEMBER EXAMINATION

UCCN1004 DATA COMMUNICATIONS AND NETWORKING

SATURDAY, 30 SEPTEMBER 2023 TIME : 2.00 PM – 4.00 PM (2 HOURS)

BACHELOR OF INFORMATION TECHNOLOGY (HONOURS)
COMMUNICATIONS AND NETWORKING
BACHELOR OF INFORMATION TECHNOLOGY (HONOURS)
COMPUTER ENGINEERING
BACHELOR OF INFORMATION SYSTEMS (HONOURS)
INFORMATION SYSTEMS ENGINEERING
BACHELOR OF INFORMATION SYSTEMS (HONOURS)
BUSINESS INFORMATION SYSTEMS
BACHELOR OF COMPUTER SCIENCE (HONOURS)
BACHELOR OF INFORMATION SYSTEMS (HONOURS)
DIGITAL ECONOMY TECHNOLOGY

Instruction to Candidates:

This question paper consists of THREE (3) questions in Section A and TWO (2) questions in Section B.

Answer **ALL** questions in **Section A** and **ONLY ONE (1)** question in **Section B**.

Should a candidate answer more than ONE (1) questions in section B, marks will only be awarded for the FIRST question in that section in the order the candidate submits the answers.

Candidates are allowed to use a scientific calculator.

Answer questions only in the answer booklet provided.

Section A (Compulsory Questions)

Q1. Answer the following questions based on the network configurations in Figure 1.

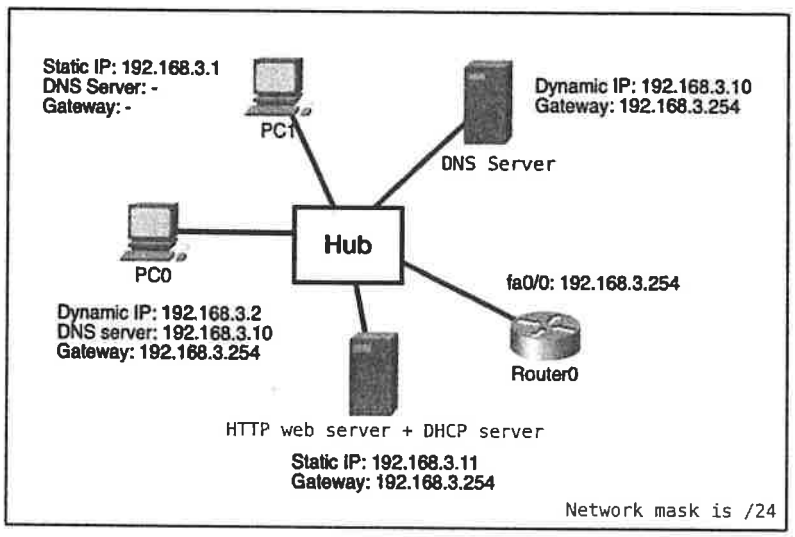


Figure 1

(a) PC1 logged into the website hosted on the web server. However, it was discovered that PC0 managed to capture the username and password of PC1. Provide **ONE (1)** explanation for how PC1's login credentials were revealed. (5 marks)

(b) Suggest **ONE (1)** network device that can be used to replace the network hub to improve network security. Explain your answer. (4 marks)

(c) The web server also serves as a DHCP server in the network. When data from different services arrived at the server, how does the server distinguish between DHCP data and HTTP data? (4 marks)

(d) Determine the following network addresses for the network in Figure 1:

(i) Network address (2 marks)

(ii) Broadcast address (2 marks)

(iii) Usable IP address range (4 marks)

(iv) Total number of host IP addresses (2 marks)

(v) The remaining usable host IP addresses (2 marks)

[Total : 25 marks]

Q2. Figure 2 shows the Virtual Local Area Network (VLAN) configurations in two managed switches.

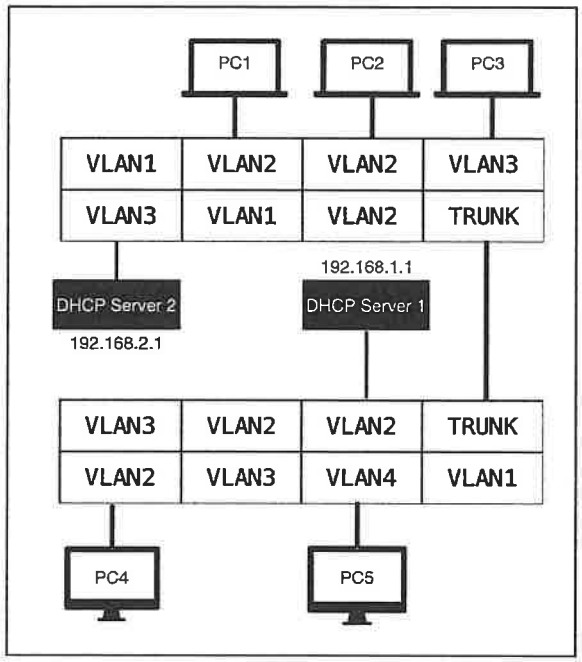


Figure 2

(a) Explain **TWO (2)** benefits of using VLANs compared to physical LANs. (6 marks)

(b) Based on Figure 2, determine if these devices can ping each other (assume VLAN spanning is configured but dot1q has not been configured).

(i) PC1 pings PC2 (2 marks)

(ii) PC1 pings PC3 (2 marks)

(iii) PC1 pings PC4 (2 marks)

(iv) PC1 pings PC5 (2 marks)

(c) Suppose that PC2 requests a dynamic IP address. Determine the device that will offer an IP address to PC2. Explain your answer. (3 marks)

(d) Draw the DORA process between PC1 and the DHCP Server. You need to indicate the IP addresses of the client and the server (assume the IP offered to PC1 is the 10^{th} usable IP of the network). (8 marks)

[Total : 25 marks]

Q3. Figure 3a shows a ring network.

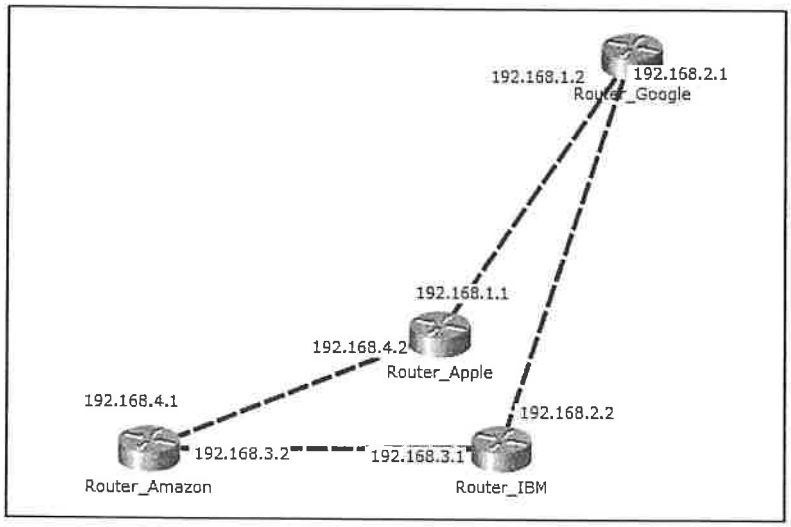


Figure 3a

(a) State the Cisco IOS command to configure **default routes** on all the routers shown in Figure 3a. (8 marks)

(b) Explain **TWO (2)** advantages of dynamic routing over static routing. (6 marks)

(c) Redraw the network in Figure 3a to improve the network redundancy (you may add any network devices and cables). (3 marks)

(d) Figure 3b shows the routing table for Router0. Determine which path will be used to reach the 192.168.2.0/24 network. Explain your answer. (4 marks)

```
C    192.168.1.0 is directly connected
C    200.200.100.0 is directly connected
C    200.200.200.0 is directly connected
C    200.200.300.0 is directly connected
S    192.168.2.0/24 [1/0] via 200.200.100.1
R    192.168.2.0/24 [120/3] via 200.200.100.1
R    192.168.2.0/24 [120/3] via 200.200.200.1
R    192.168.2.0/24 [120/3] via 200.200.300.1
```

Figure 3b

(e) State **TWO (2)** common uses of the default route in computer networking. (4 marks)

[Total : 25 marks]

Section B (Choose Any One Question)

Q4. Figure 4 shows a IPv4 packet dump captured using Wireshark. Answer the following questions based on this packet dump.

```
45 00 03 ac
74 4a 40 00
80 06 ff 44
ac 10 14 82
3a 1a 89 10
```

Figure 4

(a) Determine the size of the IPv4 header (in bytes) of this packet. (2 marks)

(b) Determine the total length (in bytes) of this IP packet. (2 marks)

(c) Calculate the payload size (in bytes) contained in the IP packet. (2 marks)

(d) Identify the 3 bits flag value (in binary) in this IP packet. (3 marks)

(e) Briefly discuss if the receiver should wait for more fragments upon receiving this packet. (2 marks)

(f) Determine how many routers can this packet traverse before being dropped? (3 marks)

(g) Assume the source host 172.16.20.130 is not configured with a default gateway. Discuss if this packet can be successfully sent to the destination. (4 marks)

(h) Suggest **ONE (1)** possible outcome if the receiver checksum value for this packet is 0x1989. Explain your answer. (3 marks)

(i) Discuss **TWO (2)** advantages TCP has over UDP. (4 marks)

[Total : 25 marks]

Q5. Figure 5 shows a *nslookup* result.

```
Server:         192.168.68.1
Address:        192.168.68.1#53

Non-authoritative answer:
Name:   www.utar.edu.my
Address: 121.123.29.55
```

Figure 5a

(a) Based on the *nslookup* result in Figure 5a, explain the flow of DNS resolution when the user browse to www.utar.edu.my. (5 marks)

(b) Draw the packet exchanges between a TELNET client who is trying to log in to a TELNET server using the username 'avo'. (6 marks)

(c) Explain **TWO (2)** SSH's advantages over TELNET regarding connection security. (4 marks)

(d) Identify the OSI layer for devices.

(i) PC (1 marks)

(ii) Router (1 marks)

(iii) Managed Switch (1 marks)

(iv) Hub (1 marks)

(v) Wireless Access Points (1 marks)

(e) Based on the access-control-list shown in Figure 5b, determine all the IP addresses that are allowed to ping 10.10.10.10. (5 marks)

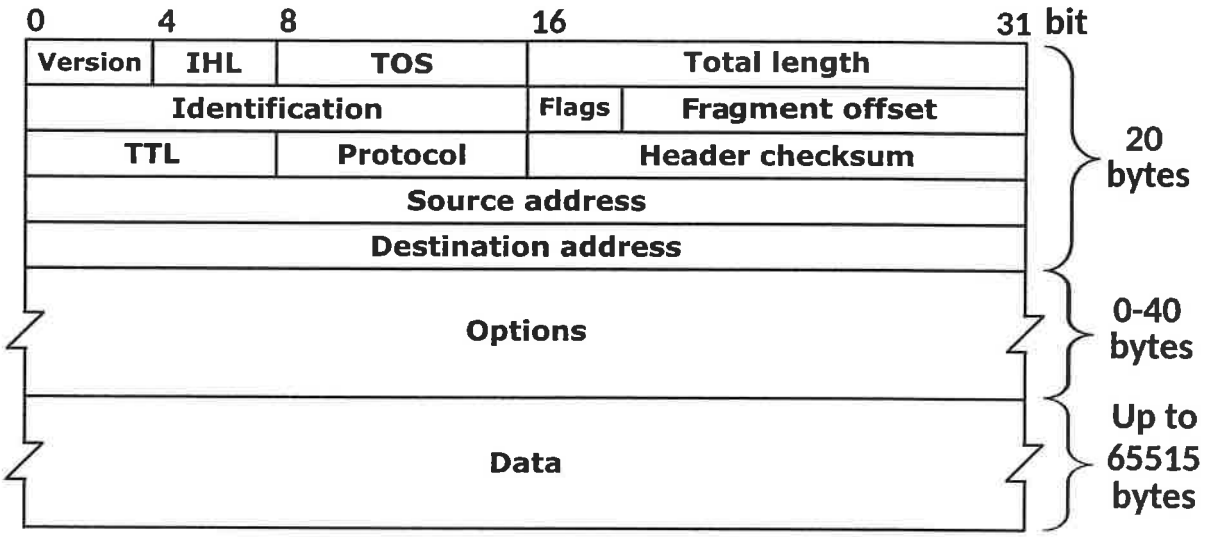
```
access-list 100 permit icmp 192.168.1.1 0.0.0.6 host 10.10.10.10
access-list 100 deny icmp host 192.168.1.2 host 10.10.10.10
access-list 100 deny icmp host 192.168.1.3 host 10.10.10.10
```

Figure 5b

[Total : 25 marks]

Appendix

Appendix I. Pv4 Header



Appendix II. TCP Header