UNIVERSITI TUNKU ABDUL RAHMAN

ACADEMIC YEAR 2022/2023

MAY EXAMINATION

UCCN1004 DATA COMMUNICATIONS AND NETWORKING

THURSDAY, 11 MAY 2023 TIME : 6.00 PM – 8.00 PM (2 HOURS)

BACHELOR OF INFORMATION TECHNOLOGY (HONOURS)
COMMUNICATIONS AND NETWORKING
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.

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Section A (Compulsory Questions)

Q1. Figure 1 shows the network topology of a local area network (LAN). Answer the following questions based on Figure 1.

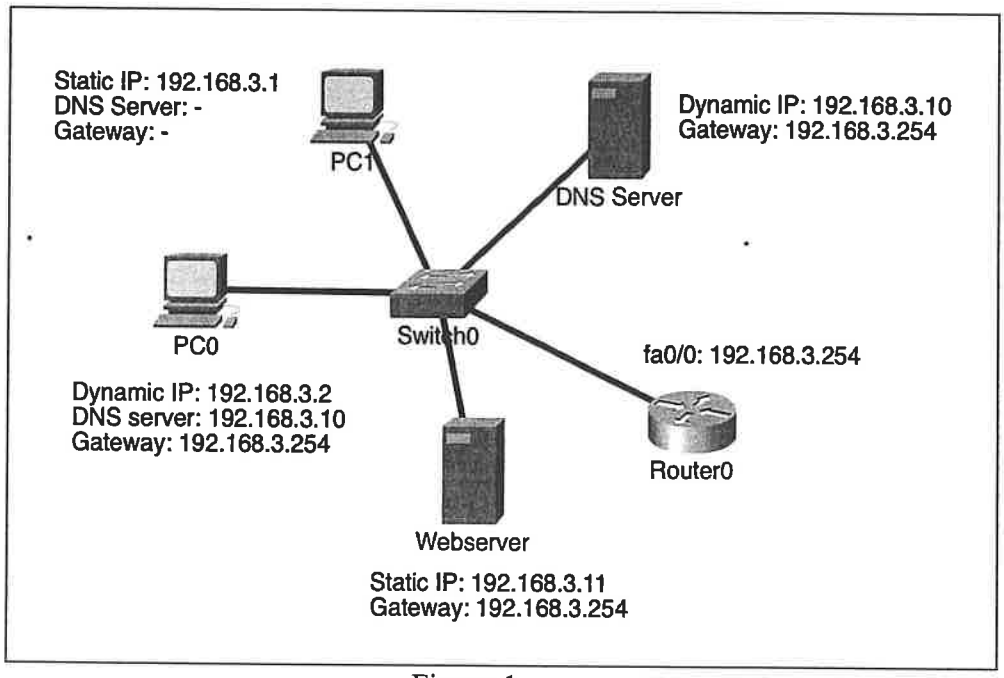

Figure 1

(a) Can PC1 browse the website hosted on the webserver? Explain your answer. (4 marks)

(b) PC0 user reported seeing errors like '*the browser cannot display the webpage*' intermittently. Suggest **ONE (1)** possible reason. (4 marks)

(c) Calculate the number of additional hosts that can be added to this network. (4 marks)

(d) Determine the IP address of PC1 if it is assigned the 100th usable IP in the network. (3 marks)

(e) Visualize the DORA process between PC0 and the DHCP server. (10 marks)

[Total : 25 marks]

Q2. Figure 2 shows the Virtual Local Area Network (VLAN) configurations in Switch S0.

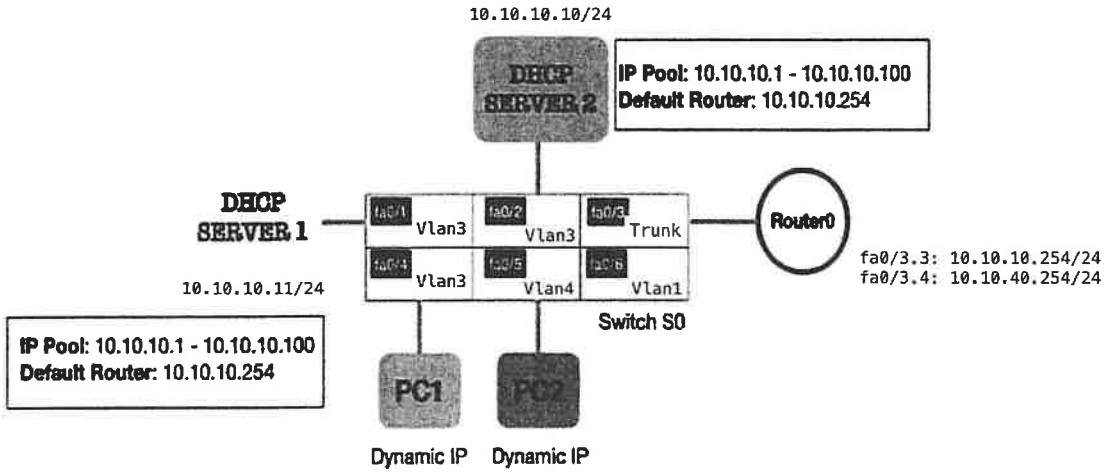

Figure 2

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

(b) Suppose that PC2 requests a dynamic IP address. Determine the device that will offer an IP address to PC2. Explain your answer. (4 marks)

(c) Suppose that PC1 requests a dynamic IP. Determine how many **DHCP OFFER** would PC1 receive. Explain your answer. (6 marks)

(d) State the dot1q command in **Router0** to assign the IP 10.10.10.254 to sub-interface fa0/3.3 (exclude router prompt). (6 marks)

(e) IP conflict can happen when DHCP Server 1 and DHCP Server 2 are configured with the same IP address pool. Explain why? (3 marks)

[Total : 25 marks]

Q3. (a) Based on Figure 3a, state the default route command on all routers to provide a bi-directional routing path to all networks. (8 marks)

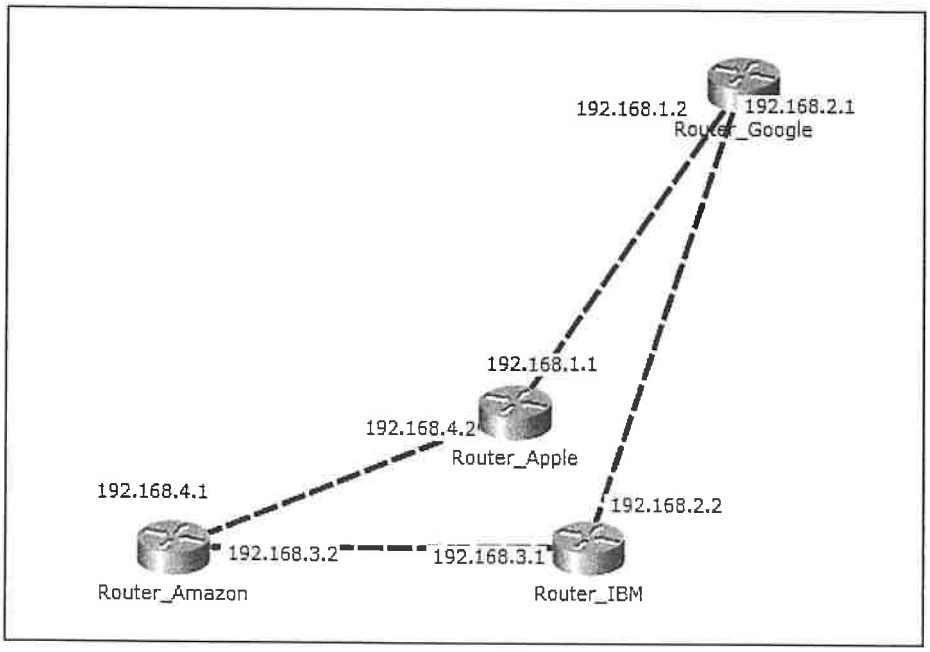

Figure 3a

(b) State the Cisco IOS command to configure **RIPv1** on Router_Apple and show the routing table in Figure 3a. (4 marks)

(c) 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. (3 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

(d) Based on Figure 3b, determine the number of routers a packet needs to traverse from Router0 to the destination network 192.168.2.0/24. (4 marks)

(e) State **TWO (2)** common uses of the default route in computer networking. (6 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 01 48 ef 8d 40 00
05 06 18 9a c0 a8 01 01
c0 a8 01 10 09 6d 00 15
70 e3 5e 4a 84 f4 3e aa
```

Figure 4

(a) Determine the size of the IPv4 header (in bytes) of this packet. (3 marks)

(b) Determine the size of options used in this IPv4 header. (3 marks)

(c) How many routers can this packet traverse before being dropped? (3 marks)

(d) Briefly discuss if the receiver should wait for more fragments upon receiving this packet. (4 marks)

(e) Assume the source host 192.168.1.1 is not configured with a default gateway. Discuss if this packet can be successfully sent to the destination. (4 marks)

(f) Suggest **ONE (1)** possible outcome if the receiver checksum value for this packet is 0x1989. (4 marks)

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

[Total : 25 marks]

Q5. (a) Figure 5a shows the topology of a home network. Based on Figure 5a, determine the following (assume all cables are CAT6a):

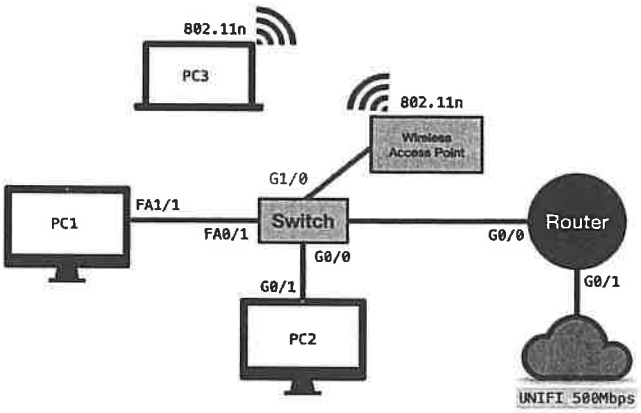

Figure 5a

(i) The maximum effective Internet bandwidth for PC1. (2 marks)

(ii) The maximum effective bandwidth from PC1 to PC2. (2 marks)

(iii) The maximum effective Internet bandwidth for PC3. (2 marks)

(iv) The maximum effective Internet bandwidth for PC2. (2 marks)

(b) Visualize the packet exchanges between a TELNET client who is trying to log in to a TELNET server using the username 'avo'. (8 marks)

(c) Discuss the advantage of SSH over TELNET in terms of connection security. (4 marks)

(d) Referring to Figure 5b, it is known that the signal deteriorates before reaching the end node. Add any necessary networking hardware to improve the reliability of signal propagation. (5 marks)

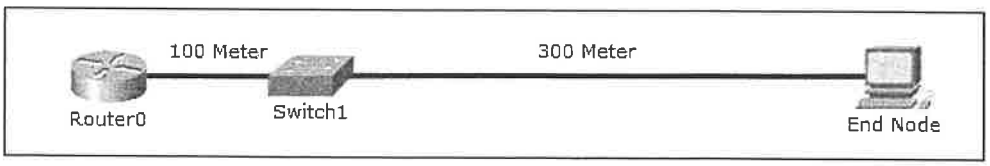

Figure 5b

[Total : 25 marks]

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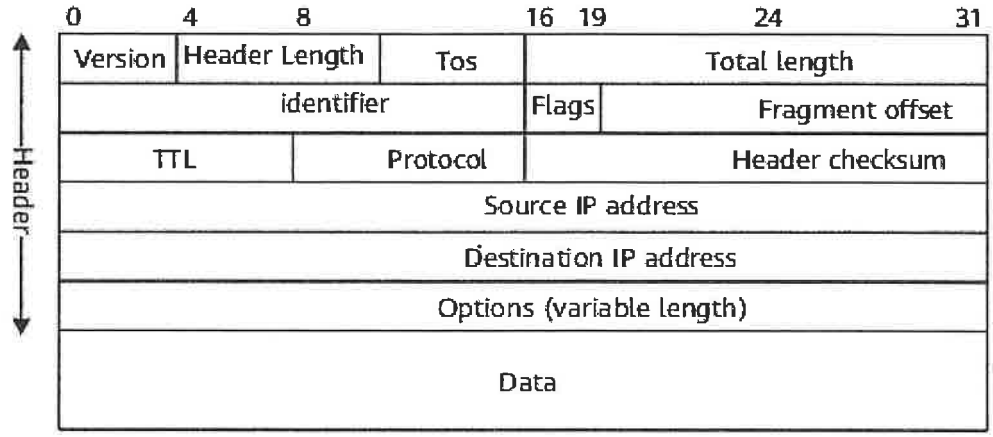
Appendix

Appendix I. Pv4 Header



Appendix II. TCP Header