CS2026 ASSIGNMENT 12 (Due Date: June 04, 2026)

Instructions: You have to answer all of them. Put your answers in a MS WORD file, or other word processing file, and then submit the file to the course Gmail account. Some answers can be found in the lecture notes.

Question 1

USB flash memory is an external memory device which can store files for some months or years.

(a) What is the full name of USB?

(b) What is the mode of data transfer between a USB memory and the computer? One bit at a time (bit by bit) or multiple bits at a time (multiple-bit by multiple-bit)?

(c) Does a USB flash memory consist of a mini hard drive inside?

(d) If a USB memory has not been used for *five* years, will the files stored still exist?

(e) What is the unit for the data transfer rate commonly used in today USB flash memory? Bytes per second (Bps), bits per second (bps) or both?

Question 2

Telecommunication network and Internet are two different networks. Both of them are able to support data communication.

(a) Which telecommunication firm in Taiwan has the largest telecommunication network?

(b) Apart from data service, what other services a telecommunication firm provide to its subscribers?

(c) If a smartphone user has subscribed *data service* from a telecommunication firm, the user is able to use the smartphone to connect to the Internet and browse webpages. State the reason why a smartphone can connect to the Internet via the telecommunication network?

(d) If there is no WiFi access point around and you have already subscribed *data service* from a telecommunication firm for your smartphone, can your smartphone access the Internet if its settings are listed below?

```
Airplane Mode   Off
WiFi            On
Bluetooth       On
Cellular        On
Hotspot         On
```

(e) If there is no WiFi access point around and you have already subscribed *data service* from a telecommunication firm for your smartphone, can your smartphone access the Internet if its settings are listed below?

```
Airplane Mode   Off
WiFi            Off
Bluetooth       Off
Cellular        On
Hotspot         Off
```

(f) If there is no WiFi access point around and you have already subscribed *data service* from a telecommunication firm for your smartphone, can your smartphone access the Internet if its settings are listed below?

```
Airplane Mode   Off
WiFi            On
Bluetooth       Off
Cellular        Off
Hotspot         Off
```

(g) Imagine that you have not subscribed *data service* for your smartphone. Are you able to use your smartphone to access Internet?

(h) If there is no WiFi access point around and you have already subscribed *data service* from a telecommunication firm for your smartphone, can your smartphone access the Internet if its settings are listed below?

```
Airplane Mode   On
WiFi            Off
Bluetooth       Off
Cellular        Off
Hotspot         Off
```

(i) Follow (h), what functions of your smartphone will be disable?

(j) If your notebook computer is set to *Airplane Mode*, can your computer connect to the Internet? What functions of your computer will be disable?

Question 3

Internet is developed to support data transfer among computers which are connected to it. Internet is a term referring to "Inter Networks", in analog to the term "Inter Nations".

(a) What is the mode of data transfer in the Internet? One bit at a time (bit by bit) or multiple bits at a time (multiple-bit by multiple-bit)?

(b) What is the unit for the data transfer rate commonly used in the Internet? Bytes per second (Bps), bits per second (bps) or both?

(c) What are the full names of MAC and IP?

(d) What is the difference between the MAC address and IP address? State the reason why we need two different addresses for the same device.

(e) Is MAC address included in an IP datagram?

(f) What is the full name of SSID and what is it used for?

Question 4

Today, each of us is able to access Internet via a local telecommunication network. Before 1990s, Internet access was limited to certain groups of companies and organizations. In that period of time, enterprises usually built their own local area networks to let the users to access the resources or services provided by the internal servers, such as email server and file server.

Back then, a typical local area network is called Ethernet. It was developed by Xero SPARC in the 1970s. The structure of an Ethernet is simple. It lets all computing devices connected to a single cable (equivalently, a bus). In technical term, the cable is their *medium* for data communication.

(a) What is the full name of CSMA/CA?

(b) State in detail the mechanism of CSMA/CA?

(c) Apart from the bus topology, state another two network topologies for local area networks (LANs).

(d) Which network topology is the most popular in today LAN?

Today, almost all LANs have been connected together to become part of the Internet. Some of them are connected by *routers*, *gateways* and *bridges*.

(e) Why some LANs do not connect to the Internet?

(f) What is the key function of a router?

(g) What is the key function of a gateway?

Question 5

Figure 1 shows a snapshot of the response from the Internet on pinging the domain `john.digi-pack.io`. The command *ping* is not a command from the Windows OS. It is a command provided by the Internet. Once the *ping* command has been entered, it will attempt to connect to the destination four times and the statistics are returned.

(a) `162.0.209.164` is the IP address of the domain `john.digi-pack.io`. State the reason why the IP address of the domain can be obtained.

(b) Why the latencies (i.e. round trip time) of the four requests are not the same?

(c) What is the purpose of *TTL*?

(d) Why a packet can be lost?

(e) Where is the geographical location of the IP address `162.0.209.164`? North American or Asia?

Question 6

Figure 2 shows a snapshot of the response from the Internet on pinging the domain `www.nchu.edu.tw`.

(a) `140.120.1.20` is the IP address of the domain `www.nchu.edu.tw`. State the reason why the IP address of the domain can be obtained.

(b) How can we confirmed that `140.120.1.20` is the IP address of the domain `www.nchu.edu.tw`?

(c) Where is the geographical location of the IP address `162.0.209.164`?

(d) State two possible reasons why all four requests timed out.

```
================================================================================
C:\Users\User>ping john.digi-pack.io

Pinging john.digi-pack.io [162.0.209.164] with 32 bytes of data:
Reply from 162.0.209.164: bytes=32 time=185ms TTL=39
Reply from 162.0.209.164: bytes=32 time=185ms TTL=39
Reply from 162.0.209.164: bytes=32 time=193ms TTL=39
Reply from 162.0.209.164: bytes=32 time=186ms TTL=39

Ping statistics for 162.0.209.164:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 185ms, Maximum = 193ms, Average = 187ms

C:\Users\User>
================================================================================
```

Figure 1: The snapshot of the ping example. The number shown after *Lost* is the percentage of packet lost. *TTL* stands for time-to-live. The *time* is the time lagged (i.e. latency) of the response received from the destination IP to my computer.

```
================================================================================
C:\Users\User>ping www.nchu.edu.tw

Pinging www.nchu.edu.tw [140.120.1.20] with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 140.120.1.20:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Users\User>
================================================================================
```

Figure 2: The snapshot of another ping example. Here, the destination server does not have any response. So, *request timed out* is shown. All packets are lost.