HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2021

INFORMATION AND COMMUNICATION TECHNOLOGY

PAPER 2B

Data Communications and Networking

Question-Answer Book

11:15 am – 12:45 pm   (1 hour 30 minutes)
This paper must be answered in English

INSTRUCTIONS

(1)   After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5 and 7.

(2)   Answer **THREE** out of four questions. Write your answers in the spaces provided in this Question-Answer book.   Do not write in the margins. Answers written in the margins will not be marked.

(3)   Supplementary answer sheets will be supplied on request. Write your candidate number, mark the question number box and stick a barcode label on each sheet, and fasten them with string **INSIDE** this book.

(4)   No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.
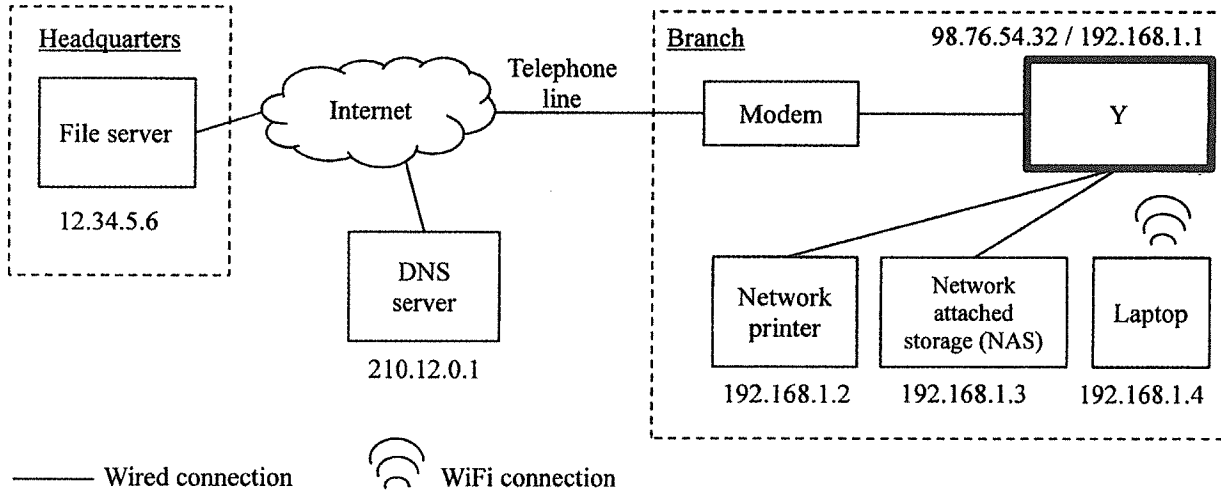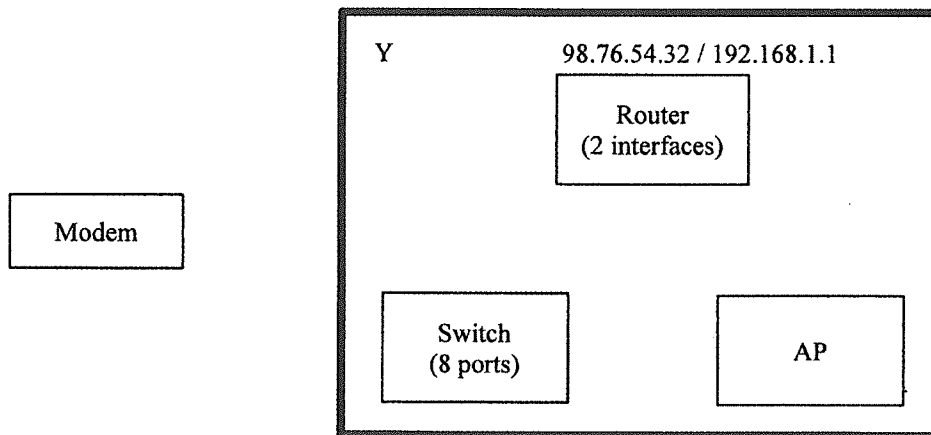
Answer THREE questions only.

1. Ms Cheung sets up the computer network of a branch of her company and configures the network manually, as follows:

(a) Y is composed of a switch, a router and an Access Point (AP).

    (i) Draw network connections in the diagram below to illustrate how the three devices in Y and the modem are connected.

(2 marks)

(ii) The laptop is sending a packet to the file server in the headquarters. Complete the packet information below.

The laptop sends the packet to Y:

IP packet header			Payload
Source IP address	Destination IP address	· · · · · ·	

Y forwards the packet to the file server in the headquarters:

IP packet header			Payload
Source IP address	Destination IP address	· · · · · ·	

(2 marks)

(b) Ms Cheung would like to use DHCP for the network in the branch.

(i) Give **two** advantages of using DHCP.

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_____

(2 marks)

(ii) Give **two** network setting attributes of the router that supports DHCP.

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(2 marks)

(iii) Identify one device in the branch in which DHCP should **not** be implemented. Explain your answer briefly.

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(2 marks)

(c) Suggest and describe **two** network security measures for Ms Cheung to use her laptop to connect to the headquarters.

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(2 marks)

(d) Ms Cheung finds that her laptop fails to connect to the file server in the headquarters. To look into the problem, she uses the ping command to check the network connectivity.

(i) She executes

```
ping 127.0.0.1
```

What is the purpose of the above command?

_____

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(1 mark)

(ii) Suggest another **two** test commands by using ping and state the purpose of the commands.

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(2 marks)

Provided by dse.life

2. A karaoke restaurant provides rooms for customers to use. Tablet computers are provided for customers to choose music videos (MVs) and check the selected playlists in the rooms.

(a) Infrared microphones are used to connect to a karaoke system in the rooms. Give **two** advantages of using infrared over radio frequency (RF) as the connection method.

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_____

_____

_____

(2 marks)

(b) The tablet computers use a WiFi connection. Give **two** advantages of using WiFi over Bluetooth as the connection method.

_____

_____

_____

_____

(2 marks)

(c) Both simplex and duplex communication modes are used in the rooms. Describe an application of each communication mode used in the rooms.

Simplex communication mode: _____

_____

_____

Duplex communication mode: _____

_____

_____

(2 marks)

The restaurant uses cloud technology to store MVs. When a customer chooses a MV, the MV is played through streaming technology. The connection for the restaurant is as follows:

- Download speed：1 Gbps
- Upload speed：400 Mbps

(d) Suppose that there is no overhead in network transmission.

(i) Estimate the time taken for staff to upload a 500MB MV file to the cloud storage.

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(2 marks)

(ii) Given that the bit rate for streaming MVs is 5 Mbps, estimate the maximum number of MVs that can be played at the same time.

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(2 marks)

The restaurant plans to provide a guest WiFi service for its customers. Some common WiFi specifications are listed below:

Frequency	Penetration power	Transmission speed	Signal coverage
2.4 GHz	Higher	Lower	Larger
5 GHz	Lower	Higher	Smaller

(e) Which frequency should be adopted for each of the following network activities? Explain your answer briefly.

Watching a soccer game live in a room: _____

_____

_____

Using instant messaging software in different areas in the restaurant: _____

_____

_____

(3 marks)

(f) After the launch of the guest WiFi service, some customers complain that the system for choosing MVs does not operate smoothly. Give a possible reason for this and explain briefly.

_____

_____

_____

_____

(2 marks)

Provided by dse.life

3.   Mr Chan works in a school installed with a class C network. It has computers as shown below:

Room	Number of computers
Staff room	80
Computer room	46
Classroom	28
Server room	10

(a) Mr Chan plans to use four subnets for the above four types of rooms. Give **two** technical reasons for using subnets.

_____

_____

_____

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(2 marks)

(b) Mr Chan plans to use the network 192.168.10.0 for assigning IP addresses in the school. Complete the table below.

Room	Usable IP range		Subnet mask
Staff room	192.168.10.1	to _____	255.255.255.128
Computer room	192.168.10.129	to 192.168.10.191	_____
Classroom	192.168.10.193	to _____	255.255.255.224
Server room	_____	to 192.168.10.254	255.255.255.224

(4 marks)

(c) Mr Chan sets up a domain controller in the school. State **two** functions of the domain controller.
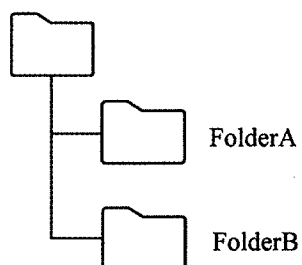
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(2 marks)

A file server is set up in the school. Mr Chan plans to let teachers and students access the following folders through the network:

Mr Chan sets the following requirements:

- Teachers can read and store teaching materials in FolderA.
- Students can read files in FolderA but they cannot modify them.
- Students can store their assignment files in FolderB but they cannot read the files in FolderB.
- Teachers can read assignment files stored in FolderB and add comments in those files.

(d) (i) Complete the permission settings in the table below. Use '✓' and '✗' to represent 'Yes' and 'No' respectively.

Folder	Teacher group permission		Student group permission	
	Read	Write	Read	Write
FolderA				
FolderB				

(2 marks)

(ii) Other than a read and write permission, state another permission that can be set.

_____

(1 mark)

(iii) Mr Chan considers using RAID-0 or RAID-5 in the file server. Describe each option and state its benefit.

RAID-0: _____

_____

_____

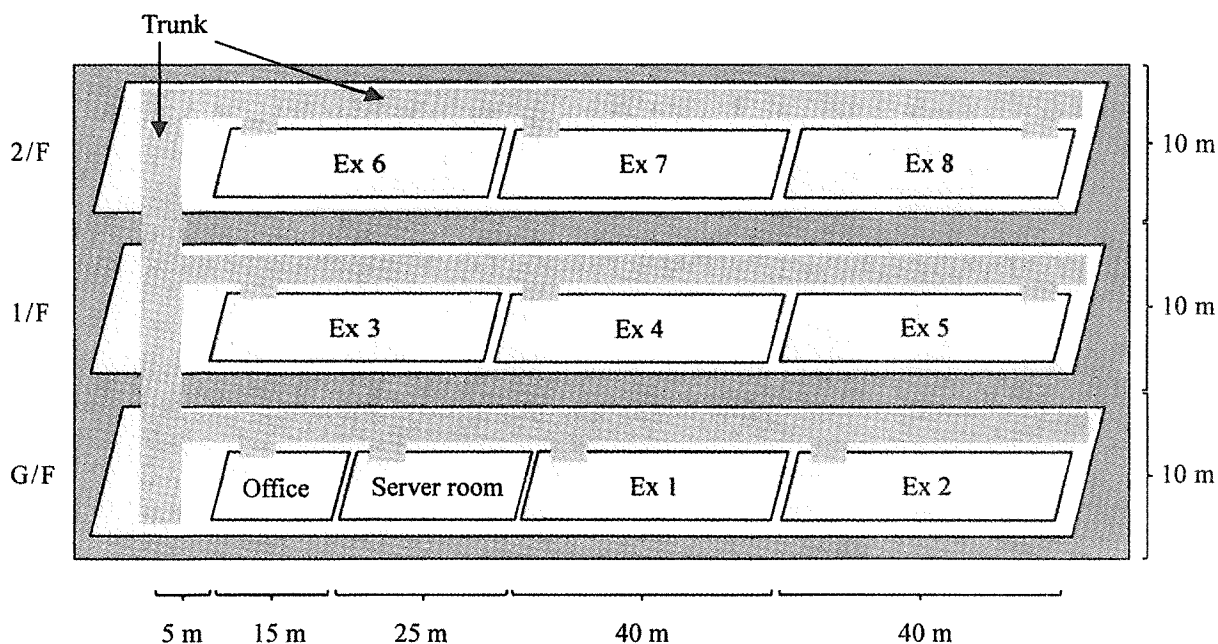_____

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RAID-5: _____

_____

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_____

(4 marks)

4. An exhibition centre has three floors. Each floor is 10 m tall. There are 8 exhibition rooms (Ex1, Ex2, ..., Ex8) in the centre, 40 m × 40 m each. The server room is located on G/F. There is an Access Point (AP) in each exhibition room while a wired network is used in the office.

Trunk

2/F	Ex 6	Ex 7	Ex 8	10 m
1/F	Ex 3	Ex 4	Ex 5	10 m
G/F	Office	Server room	Ex 1	Ex 2	10 m

5 m   15 m   25 m   40 m   40 m

Mr Li designs the network and adopts a star topology. He uses UTP cables to connect each AP directly to a switch in the server room through the trunks.

(a) Give one advantage and one disadvantage of using the star topology.
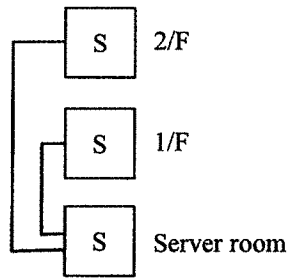
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(2 marks)

(b) Mr Li finds that the network connections to Ex 5 and Ex 8 are not stable. However, he finds no problem in other exhibition rooms. Give **two** reasons for this situation.
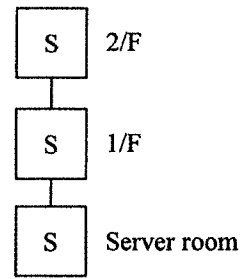
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(2 marks)

(c) In order to improve the overall network performance, Mr Li suggests adding a switch S on 1/F and 2/F to connect to APs on their corresponding floors. He has two plans below:

Plan 1   Plan 2

State one advantage of Plan 1 and one advantage of Plan 2.

Plan 1: _____

_____

_____

Plan 2: _____

_____

_____

(2 marks)

(d) The centre supports WiFi roaming so that visitors can connect to the WiFi network without interruption. Give **two** network settings that Mr Li needs to set.
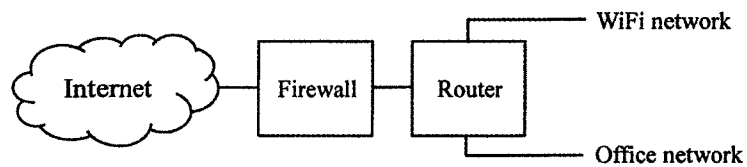
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(2 marks)

(e) In the server room, Mr Li installs a firewall and a router for connecting to the wired network in the office and the WiFi network in the exhibition rooms, as the configuration below:

(i) From a security point of view, state one advantage and one disadvantage of the configuration above.

Advantage: _____

_____

_____

Disadvantage: _____

_____

_____

(2 marks)

(ii) Complete the logical network design in the following diagram. The following items should be added to the diagram:

- three computers in the office
- a domain controller, a firewall, a router and a switch
- all necessary network connections

Use the following symbols to represent the relevant network components:

C	DC	S	R	F
Computer	Domain controller	Switch	Router	Firewall
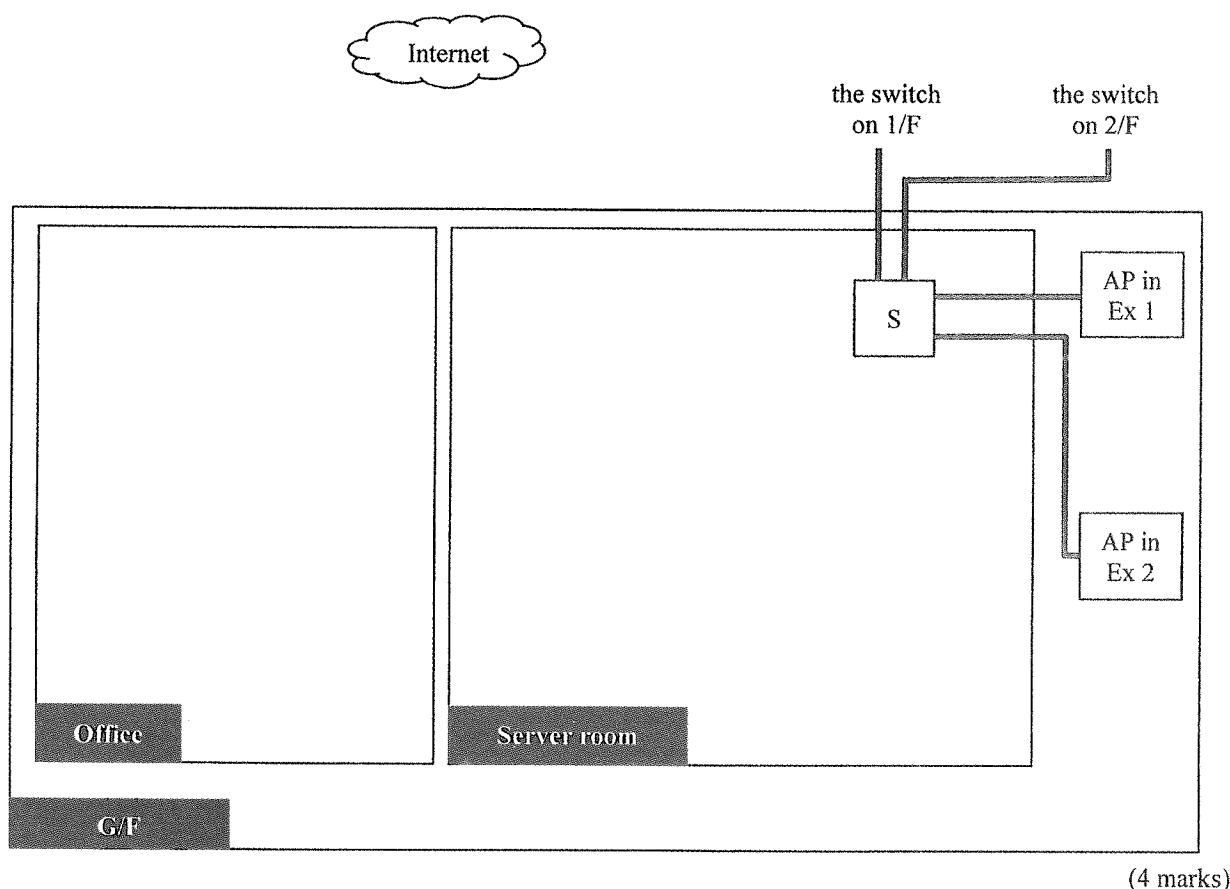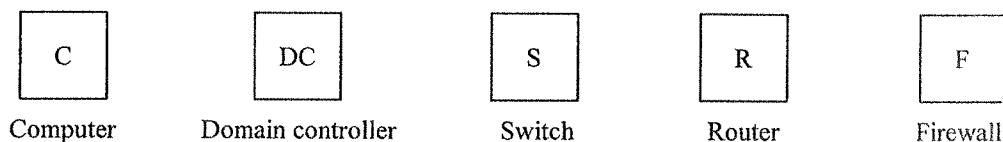
(4 marks)

(iii) Give a reason for connecting the domain controller to the device in your design.

_____

_____

(1 mark)

END OF PAPER