

**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

Please stick the barcode label here.

Candidate Number

**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 and 5.
- (2) **ANSWER ALL 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 all questions.**

1. Mr Li works in the management office of an airport. He is going to set up a Wi-Fi network for travellers to access the Internet through a number of access points.

(a) Mr Li sets up some access points. They support the following wireless network standards:

802.11ac, 802.11n and 802.11g

Give two major differences between the above network standards.

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(2 marks)

(b) Mr Li configures the SSIDs of the access points.

(i) Explain the function of an SSID in a wireless network.

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(ii) Mr Li should not use the default name for SSID when setting up the access points. Why not?

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(iii) Mr Li should use a single SSID for all access points. Why?

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(3 marks)

Mr Li sets up two Wi-Fi networks with different SSIDs, as shown below:

Network 1: No security measures are applied.

Network 2: WPA2 is applied.

(c) (i) Give two advantages of Network 1 over Network 2.

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Please stick the barcode label here.

(ii) Briefly explain why Mr Li uses WPA2 instead of WEP in Network 2.

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(iii) What is the difference between transmitting data in Network 1 and Network 2?

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(4 marks)

(d) (i) Explain why CSMA/CD is not suitable for wireless networks.

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(ii) Suppose that a user is downloading a file while another user is sending an email in Network 2. How can CSMA/CA help avoid collisions?

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(3 marks)

(e) Some shops in the airport provide Wi-Fi networks for customers. Give **two** pieces of advice to these shops on setting up their Wi-Fi networks.

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(2 marks)

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2. ABC company plans to develop a smart card payment system similar to the Octopus Card. Users can use their smart cards to pay bills in retail shops. The shops will upload the transaction data to the database server of ABC company in batch mode.

(a) (i) Give a disadvantage of the batch mode for the data upload.

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(ii) Give two technical issues to consider if the batch mode were to be replaced by a real-time mode.

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(3 marks)

(b) The company designs a disaster recovery plan for the database server. Part of the plan is as follows:

- (1) Create the backup of the system configurations
- (2) Create the backup of the database
- (3) Test the recovery process using the backup files

(i) What is the benefit of having the backup in (1) when recovery is taking place?

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(ii) Someone suggests that the backup files in (2) should be stored in a remote location. Why?

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(iii) It is expected that 10 GB of new data will be stored in the database server every hour and a backup should be created every day. Which kind of backup medium should be used? Explain briefly.

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(4 marks)

Please stick the barcode label here.

- (c) Other than a backup, suggest and describe a solution that can help to protect the data stored in the database server against each of the following situations:

(i) Unauthorised access

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(ii) Failure of a hard disk

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(iii) Power interruption

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(6 marks)

- (d) Someone suggests using an online storage service for the database server. Give an advantage and a disadvantage of using an online storage service for the payment system.

Advantage: \_\_\_\_\_

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Disadvantage: \_\_\_\_\_

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(2 marks)

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3. ABC school promotes mobile learning and BYOD (Bring Your Own Device). All students bring their own devices to school for use in lessons. The materials used in the lessons are stored in the school server.

(a) Two IP addresses, 192.168.1.1 and 210.0.205.237, are both assigned to the only router in the school.

(i) Which IP address is used for connecting to the Internet?

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(ii) What is the use of the other IP address?

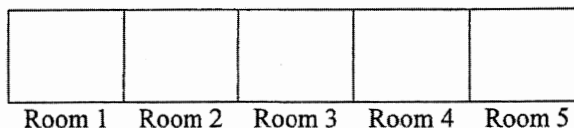
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(2 marks)

Some access points are installed on the first floor of the school. Each access point supports a maximum data transfer rate of 1 Gbps. The floor plan is shown below:

First floor



An e-learning activity will be conducted and each student will use 15 Mbps when participating in the activity.

(b) (i) Suppose that only two wireless access points are installed. Calculate the maximum number of students who can participate in the activity at the same time.

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(ii) The school should set the number of available network connections to a smaller number than the maximum number of students in (b)(i). Why?

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(iii) Eventually, the school installs more than two access points though there is no issue with the network bandwidth. Give two reasons why more access points should be installed.

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(5 marks)

Answers written in the margins will not be marked.



Suppose that there is only one network for students to connect to. The setup page of the students' mobile devices for connecting to the school network is shown below:

DHCP	<input type="radio"/> Yes	<input checked="" type="radio"/> No
IP address:		
Subnet mask:		
Gateway:		
DNS:		

- (c) (i) Give one advantage to the students of choosing DHCP.

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- (ii) Are the values of each of the following items in **all** students' mobile devices the same? Circle your answer.

- |                 |                  |
|-----------------|------------------|
| (1) IP address  | same / different |
| (2) Subnet mask | same / different |
| (3) Gateway     | same / different |
| (4) DNS         | same / different |

- (iii) What is the 'Gateway'?

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(6 marks)

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Answers written in the margins will not be marked.

(d) The school would like to introduce an 'acceptable use policy' to tell students how to use the school network properly on their devices.

(i) Give **two** ethical practices that should be included in the policy.

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(ii) Describe **two** other guidelines that should be included in the policy.

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(4 marks)

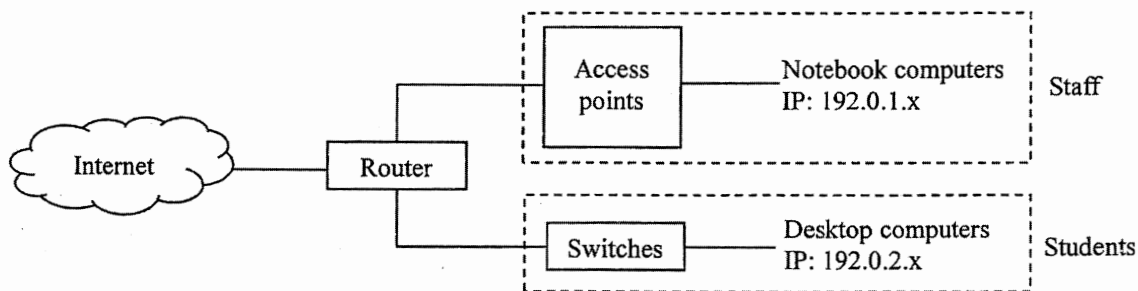
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4. Paul is a network engineer. He designs a computer network for a learning centre, as shown below:



The network has 30 notebook computers for staff and 200 desktop computers for students. The IP addresses assigned in the staff's subnet are 192.0.1.x and those in the students' subnet are 192.0.2.x.

- (a) Give two advantages and two disadvantages of using two subnets instead of one subnet in the learning centre.

Advantages: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Disadvantages: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(4 marks)

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(b) Paul needs to configure the router.

(i) Is 255.255.255.128 a suitable subnet mask for the students' subnet? Explain briefly.

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(ii) Paul establishes communication between the two subnets. Briefly describe how he configures the gateway for the router.

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(4 marks)

HKEDCITY.EDU.HK is a valid domain name. Paul uses the PING utility to test the network connectivity. The screen output is shown below:

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C:\>PING HKEDCITY.EDU.HK
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for HKEDCITY.EDU.HK:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss)
```

(c) (i) Paul finds that he can access the Intranet in the learning centre but he cannot access HKEDCITY.EDU.HK. Why not? Give **two** possible reasons.

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(ii) Other than using the PING utility, suggest **two** other ways to test the network connectivity.

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(4 marks)

(d) Someone argues that the PING utility can be used for a Denial of Service (DoS) attack. Do you agree? Explain briefly.

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(2 marks)

**END OF PAPER**

Answers written in the margins will not be marked.