2013-DSE
ICT
PAPER 2B

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HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2013

Candidate Number									

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 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.

* A 2 0 0 E 0 2 B *

Answer all questions.

1. Vicky uses her tablet computer to access the Internet through the WiFi network at home. She types the URL, 'http://192.168.10.3:80', in a browser and logs on to the wireless router at home. A summary screen is shown below.

LAN Interface: 192.168.10.3 / Network mask: [redacted]
WAN Interface: 130.13.4.76 / Network mask: 255.255.255.0
WiFi protocol: 802.11n
SSID: VHome
Automatic channel selection: Enabled
Channel: 1
Encryption Method: WEP
Encryption Key: 123abc
VPN: Enabled
MAC Filtering: Enabled
Access Control List: 02-21-70-0E-F5-12; 00-22-5E-15-1D-13

She also checks the network setting of her tablet computer and the output screen is shown below.

MAC address: 00-22-5E-15-1D-13
IP address: 192.168.10.7
Default gateway: [redacted]

(a) (i) What does the value '80' after the colon in the URL mean? _____

(ii) What are the contents of the shaded areas on the two screens?

Network mask: _____

Default gateway: _____

(3 marks)

(b) (i) What is the function of the gateway in the network?

_____

_____

(ii) What is the benefit to Vicky of enabling VPN in the router?

_____

_____

(iii) DHCP is used in the network. How does this help the network connection?

_____

_____

(3 marks)

Answers written in the margins will not be marked.

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(c) (i) Suggest **two** changes in the settings of the router which would improve the security.

(ii) Vicky finds that the tablet computer is out of order. She buys a new one which is of the same model and uses the same settings as the old one. However she cannot connect it to the WiFi network. Why? What change in the settings of the router should she make?

(4 marks)

(d) Vicky enables automatic channel selection instead of the fixed channels for the router. Why?

(2 marks)

(e) Vicky has a notebook computer. The network supports wired and wireless connections. Vicky decides to use the wired connection for the notebook computer. Apart from bandwidth, suggest and describe **two** reasons to support her decision.

(4 marks)

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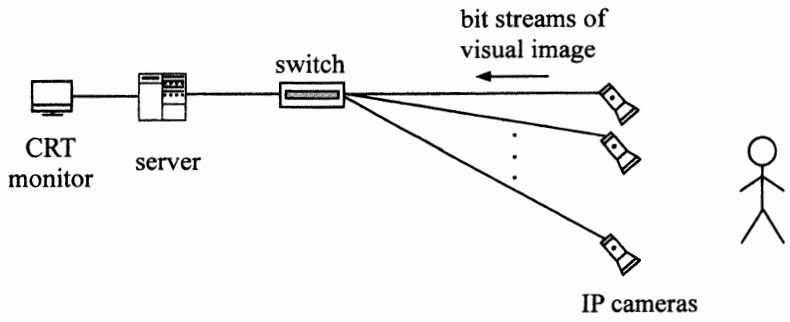
2. A commercial building has a security system which consists of a computer network. The network is made of CAT5 cables and IP cameras which only support the simplex mode. All IP cameras will capture and send visual images to the server in the property management office. The network diagram is shown below.



(a) Analog data and digital data are involved in the data processing in this security system.

(i) Give an example of the analog data.

_____

(ii) Give an example of the digital data.

_____

(iii) Where does the conversion from analog data to digital data take place?

_____

(iv) Where does the conversion from digital data to analog data take place?

_____

(4 marks)

(b) (i) Briefly describe the data flow in these cameras to illustrate the simplex mode.

_____

_____

(ii) The security system uses synchronous transmission. Give one advantage and one disadvantage of using synchronous transmission.

_____

_____

_____

_____

(3 marks)

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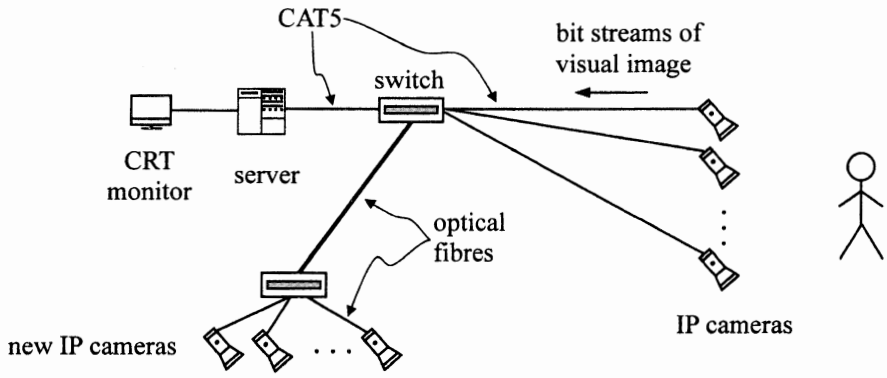
(c) The security system is upgraded with IP cameras which support the duplex mode, as shown below.



(i) Data captured by the cameras is stored on the server. Optical fibre instead of CAT5 cable is used for the new cameras but the network throughput does not improve. Give **two** upgrade suggestions for improving the network throughput.

(ii) Briefly describe the data flow in the new IP cameras, to illustrate the duplex mode.

(4 marks)

(d) In each of the following cases, which protocol, UDP or TCP, should be used? Explain briefly.

(i) The visual images are sent to a server for storage.

(ii) Security officers can instantly view the visual images of the lobby.

(4 marks)

Answers written in the margins will not be marked.

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3. Mr Chan is a network designer who is responsible for designing a wireless network in a hall in a museum. This project aims to provide the following services for visitors to the hall:

- Visitors can use the mobile devices provided by the museum to access its Intranet and acquire information about the exhibition.
- The network serves roughly 100 visitors to the hall during the peak hours.
- The response time of the services should be less than 5 seconds.

(a) (i) Describe **two** network tests that Mr Chan has to do during the testing stage.

(ii) The museum plans to allow visitors to use their own mobile devices. Give **two** considerations that the museum should bear in mind before implementing this plan.

(4 marks)

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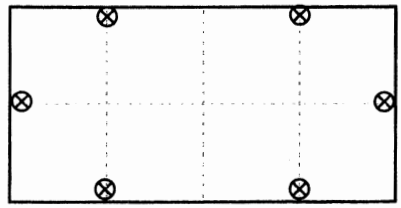
The floor size of the hall is 40m × 80m. Mr Chan mounts six wireless Access Points (APs) on the ceiling of the hall, as shown below. The APs support a signal range of up to 40m.

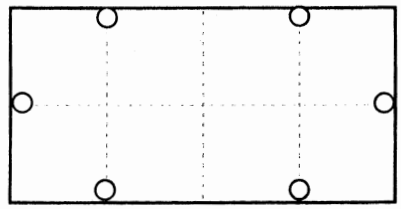


⊗ Access Point

(b) One day, four APs are out of order.

(i) What problems might visitors encounter? Give **three** examples.

(ii) Mr Chan plans to relocate the remaining two APs to two of the existing six positions. Draw the two locations for the APs on the design below and explain your answer briefly.



⊗ Access Point

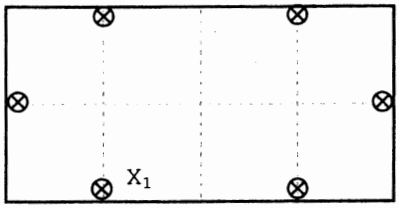
(5 marks)

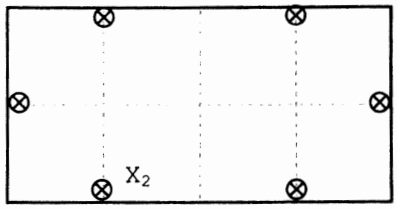
(c) An IT company will donate as many as APs Mr Chan wants. Someone suggests that Mr Chan should mount more APs, for example, one AP every 5 m^2. Give **two** disadvantages of this suggestion.

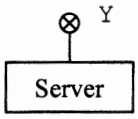
(2 marks)

Answers written in the margins will not be marked.

(d) Mr Chan will build the wireless network in two halls of the museum. X_1 and X_2 are the APs in the two halls, as shown below. They are used for connecting Y, the AP connected to the server of the network, so that visitors can access the server through all APs in the two halls.







(i) Mr Chan needs to install Y instead of network cables for connecting X_1 and X_2 to the server. Give one reason to explain why network cables should not be used.

(ii) What major task will X_1 perform when interacting with the other five APs in the hall?

(3 marks)

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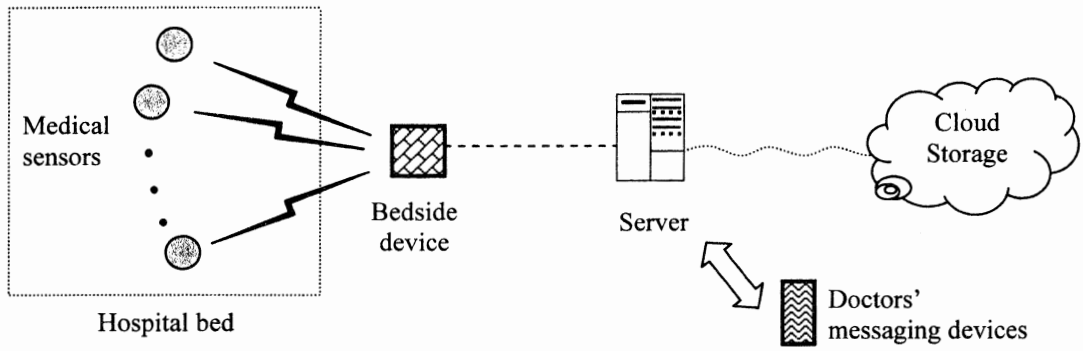
4. The following diagram shows the network design in a hospital. Each hospital bed contains medical sensors. The patients' medical data is collected and stored in a server, and is then sent to doctors' messaging devices.



(a) Patients' medical data is sent from the server to doctors' messaging devices through the hospital's WiFi network instead of the public mobile network. Give **two** reasons to support the use of the WiFi network.

_____

_____

_____

_____

(2 marks)

(b) Patients' medical data collected from the medical sensors is sent to doctors' messaging devices via the server. What are the major functions of the server regarding network management? Give **two** examples.

_____

_____

_____

_____

(2 marks)

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(c) Packet switching is used for the data transmission between the server and doctors' messaging devices.

(i) Circuit switching should not be used in this case. Why not?

(ii) Describe the packet switching mechanism for the data transmission.

(4 marks)

The network design uses Cloud storage, that is, online storage managed by third parties through the Internet.

(d) (i) Give **two** benefits of using Cloud storage.

(ii) Give **two** potential problems of using Cloud storage.

(4 marks)

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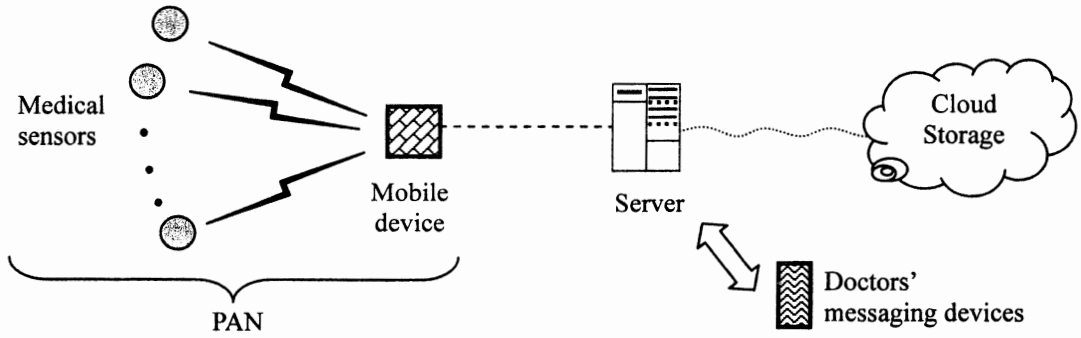
The bedside device is a mobile device which allows a patient to move around the hospital with the device. It forms a personal area network (PAN) with medical sensors for communication, as shown below.



(e) (i) Suggest an appropriate type of transmission medium for transmitting data between the mobile device and the medical sensors.

_____

(ii) Other than the transmission medium, give **two** characteristics of a PAN which make it different from a local area network.

_____

_____

_____

(3 marks)

END OF PAPER

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