Week3 IEEE 802.11 无线局域网络 (Wireless LAN)

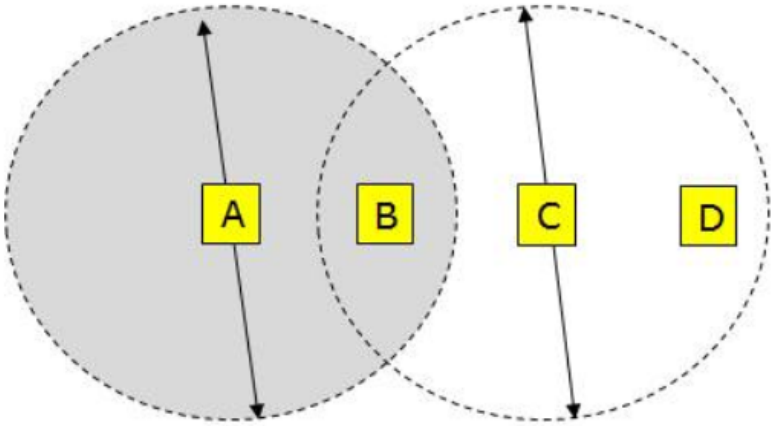
Wireless LAN 1

3.1 In IEEE 802.11 Wireless LAN, the signals are propagated through which media ?
在IEEE 802.11 無線區域網協定中，訊息透過下列哪個媒介傳輸?

- Coaxial cable同軸電纜
- Optical fiber光纖
- Twisted pair雙絞線
- Space (air) 空間（空氣, 無線電波）
- Power Line 電源線

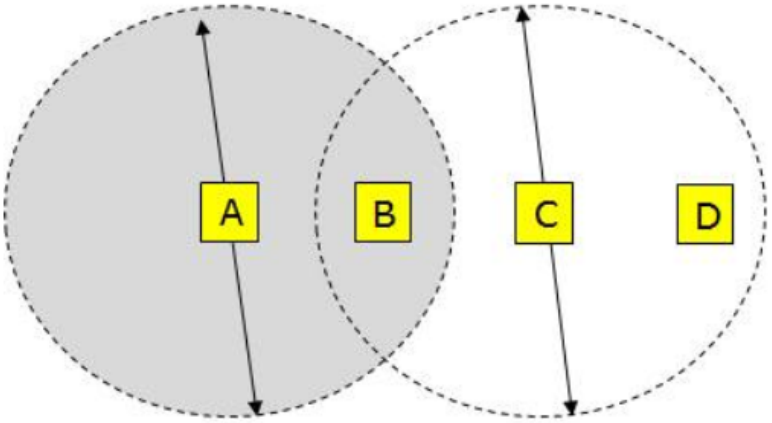
Wireless LAN 2

3.2 Assume each of four nodes is able to send and receive signals that reach just the nodes to its immedi ate left and right. Suppose both A and C want to communicate with B and so they each send it a frame. W hich of the following statements are correct for “hidden node problem” ?
設想下面四個節點都只能跟鄰近左右邊的點傳收訊息，假設現在A和C都想要跟B通訊，所以各自都對B送了一個訊框，下列哪些對於「隱藏節點問題」的敘述是正確的?



- [x] These two frames collide with each other at B 這兩個訊框「會」在 B 處碰撞
- [ ] These two frames will NOT collide with each other at B 這兩個訊框「不會」在 B 處碰撞
- [x] Neither A nor C is aware of this collision A和C都不會察覺這次碰撞
- [ ] Both A and C are aware of this collision A和C都會察覺這次碰撞
- [x] A and C are said to hidden nodes with respect to each other A 和 C 是彼此的隱藏節點

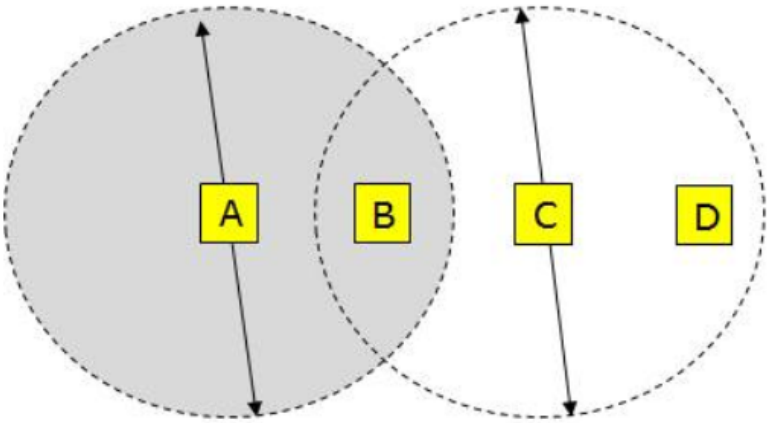
3.3.For the following wireless configuration, which two nodes are hidden from each other ? Assume B can exchange frames with A and C, but it cannot reach D. And C can reach B and D but not A
下列無線網路配置中，哪兩個點是彼此的隱藏節點? 假設 B 可以跟 A、C 交換訊框，但不行跟 D 通訊，而 C 可以和 B、D 通訊，但不行跟 A 通訊。



- [x] A and C
- [ ] A and D
- [x] B and D
- [ ] B and C
- [ ] C and D

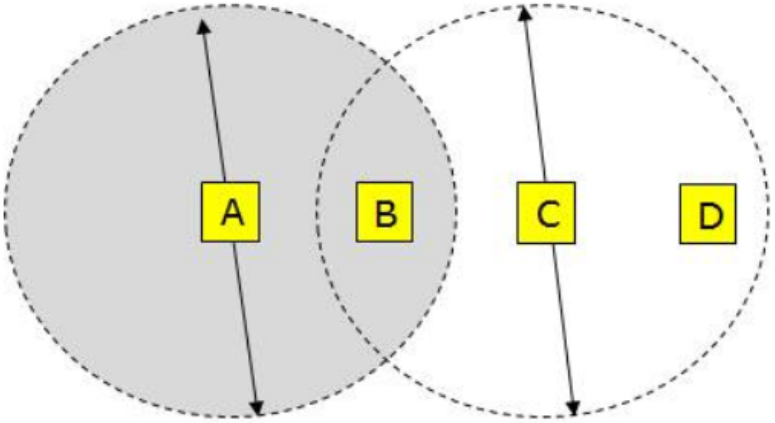
3.4.Assume each of four nodes is able to send and receive signals that reach just the nodes to its immedi

ate left and right. Suppose B is sending a frame to A. Which of the following statements are correct for “exposed node problem” ?
設想下面四個節點都只能跟鄰近左右邊的節點傳收訊息，假設B正在送一個訊框給A，下列哪些對於「暴露節點問題」的敘述是正確的?



- [x] Although B and C are exposed to each other’s signals, there is no interference if B transmits to A while C transmits to D. 雖然 B 和 C 的訊號彼此暴露，但是 B 傳給 A 而 C 也同時傳給 D 時，A 跟 D 都可以成功收到訊框 (兩者並不會有衝撞)
- [ ] C cannot transmit to anyone because it can hear B’s transmission. C不能傳訊息給任何人，因為C聽到B正在傳輸
- [x] C is able to transmit to node D C可以傳送給D
- [ ] D is able to transmit to node C D可以傳送給C
- [ ] A is able to transmit to node B A可以傳送給B

3.5.For the following wireless configuration, which two nodes are exposed to each other ? Assume B can exchange frames with A and C, but it cannot reach D. And C can reach B and D but not A
下列無線網路的配置中，哪兩個節點彼此是對方的暴露節點? 假設B可以跟A、C交換訊框，但是不能跟D通訊，C可以跟B、D通訊，但不能跟A通訊。



- [x] A and B
- [ ] A and C
- [x] B and C
- [ ] B and D
- [x] C and D

Wireless LAN 3

3.6.What are the purposes of RTS and CTS control frames used in IEEE 802.11 wireless LAN ?

IEEE 802.11無線區域網中，使用RTS和CTS控制訊框的目的是什麼?

- [x] (a) Reserve the wireless channel for a time period. 預約無線通道一段時間
- [x] (b) Informs all nearby nodes that a transmission is about to begin 告知所有附近的節點有一個傳輸正要開始。
- [ ] (c) These two frames also contain data to transmit. 這兩種控制訊框也包含要傳輸的數據。
- [ ] (d) The sender is asking the receiver to send back a frame after a time period 傳送端發出要求給接收端，並要求接收端一段時間(預約時間)後須回傳一個訊框
- [x] (e) The duration field in the RTS and CTS frames is used to specify the time period RTS和CTS的持續時間欄位用來指明預約時間長短

802.11 using RTS and CTS frames to reserve the wireless channel for a time period (duration field in the RTS and CTS frames)

3.7.For IEEE 802.11 CSMA/CA protocol, which of the following statements are correct for any node that s

ees a CTS frame ?
在IEEE 802.11 CSMA/CA 協議裡，關於看到CTS的任何節點，下列哪個敘述是正確的?

- [ ] (a) It is close to the sender and therefore it can transmit for the period of time specified in the CTS frame. 節點很靠近傳送端，所以在 CTS 訊框上記載的時間內都可以傳送訊息
- [x] (b) It is close to the receiver and therefore cannot transmit for the period of time specified in the CTS frame. 節點很靠近接收端，所以在CTS訊框上記載的時間內都不可以傳送訊息
- [ ] (c) It is not close enough to the receiver to interfere with it, so is free to transmit. 節點沒有靠近接收端到會影響接收端的程度，所以可以自由傳送
- [ ] (d) It is not close enough to the sender to interfere with it, so is free to transmit. 節點沒有靠近傳送端到會影響傳送端的程度，所以可以自由傳送。
- [ ] (e) It is close to the receiver and therefore can transmit for the period of time specified in the CTS frame. 節點很靠近接收端，所以在CTS訊框上記載的時間內都可以傳送

Wireless LAN 4

3.8.For IEEE 802.11 CSMA/CA protocol, which of the following statements are correct for any node that s

ees an RTS frame but not the CTS frame ?
在IEE 802.11 CSMA/CA 協定裡，關於那些可以看到RTS，但是沒看到CTS的訊框，下列哪些敘述是正確的?

- [x] (a) It is close to the sender and therefore cannot transmit for the period of time specified in the RTS frame. 節點太靠近傳送端，不可以在 RTS 訊框上記載的時間內發送訊息。
- [ ] (b) It is close to the sender and therefore can transmit for the period of time specified in the RTS frame. 節點太靠近傳送端，可以在 RTS 訊框上記載的時間內發送訊息。
- [ ] (c) It is not close enough to the receiver to interfere with it, so is free to transmit. 節點沒有靠近接收端到會影響接收端的程度，所以可以自由傳送。
- [ ] (d) It is not close enough to the sender to interfere with it, so is free to transmit. 節點沒有靠近傳送端到會影響傳送端的程度，所以可以自由傳送。
- [ ] (e) It is close to the receiver and therefore can transmit for the period of time specified in the RTS frame. 節點很靠近接收端，可以在 RTS 訊框上記載的時間內都可以傳送訊息。

- Any node that sees the CTS frame
  - it is close to the receiver, therefore
  - cannot transmit for the period of time specified in the CTS frame
- Any node that **sees the RTS frame but not the CTS frame**
  - is not close enough to the receiver to interfere with it, so is free to transmit

似乎答案有误

3.9.For IEEE 802.11 CSMA/CA protocol, what happens if nodes A and B detect an idle link and transmit a

n RTS frame to node C at the same time ? Assume that nodes A ,B and C are located within the transmission range of each other.
在 IEEE 802.11 CSMA/CA 協議裡, 如果A和B同時偵測到一個閒置的通道，且同時都傳了一個 RTS 訊框給節點 C，這樣會發生甚麼事? 假設A, B 和 C 都位於彼此的傳輸範圍內。

- [ ] (a) Both the RTS frames will be transmitted successfully without collision. 兩個RTS訊框都會傳送成功不會產生碰撞。
- [x] (b) These two RTS frames will collide with each other 兩個 RTS 訊框會在節點 C 發生碰撞。
- [x] (c) The senders realize the collision has happened when they do not receive the CTS frame after a period of time 當一段時間後，兩個傳送端都沒有收到 CTS 訊框時，他們會知道發生碰撞
- [ ] (d) The senders realize the collision has happened by using a collision detection algorithm like the Ethernet. 兩個傳送端透過跟乙太網路一樣的碰撞感測演算法，偵測到碰撞已發生
- [x] (e) Collison will happen at node C, and each sender waits a random amount of time before trying again, where the amount of time is defined like the exponential backoff algorithm used in the Ethernet CSMA/CD protocol. 碰撞會在節點 C 發生，A 與 B 都會等待一段隨機時間後再嘗試傳送，等待的時間長度是由指數後退演算法(exponential backoff algorithm)來決定，跟乙太網路CSMA/CD協議類似

Wireless LAN 5

3.10. Please fill in the number for the “active scanning” steps of a node to select an AP in IEEE 802.11 wireless LAN.
主動掃描(active scanning)是802.11無線區域中，節點去選擇AP的過程。請在下列主動掃描步驟中，填入名詞的編號。
(1) 信標 (a Beacon) (2) 信標回應 (a Beacon response)
(3) 探測 (a probe) (4) 探測回應 (a probe response)
(5) 連接要求 (an association request) (6) 連接回應 (an association response)
(7) 輪詢 (a poll) (8) 輪詢回應 (a poll response)

Step1. The node sends __A__ frame
節點會送出一個 __A__ 訊框。

Step 2. All APs within reach reply with __B__ frame
所有AP會回傳一個 ___B___ 訊框。

Step 3. The node selects one of the APs and sends that AP __C__ frame
節點會從所有AP中選擇其中一個AP，然後送給AP一個 ___C___ 訊框。

Step 4. The AP replies with ___D___ frame
AP會再回傳一個 ___D___ 訊框。

A 3

B 4

C 5

D 6

Wireless LAN 6

3.12.At most how many MAC addresses may be contained in an IEEE 802.11 wireless LAN frame ?

在IEEE 802.11無線區域網路標準中，一個訊框中最多包含幾個MAC位址?

- 2
- 3
- 4
- 5
- 6

Wireless LAN 7

3.13. Which of the following statements are correct for the “super-frame” structure in IEEE 802.11 ?
下列關於IEEE 802.11超級訊框(super frame)結構的敘述是正確的?

- (a) All super frames have the same size. 所有超級訊框都同樣大小
- (b) Super frames may have different sizes. 超級訊框可能大小不同
- (c) A contention-free burst occurs at the beginning, followed by a contention period. 先有一段免競爭式的叢發性流量，隨後是競爭週期 (contention period)
- (d) A contention period occurs at the beginning, followed by a contention-free burst. 先有一段競爭式的叢發性流量，隨後是免競爭週期 (contention-free period)
- (e) The length of the contention-free burst in each super frame is fixed. 每個超級訊框中免競爭流量的長度都是固定的

Wireless LAN 8

3.14. Which of the following statements are correct for the “positive acknowledgement” scheme used in IEEE 802.11 CSMA/CA protocol ?
有關於IEEE 802.11 CSMA/CA 協議裡使用的正向回覆 (positive acknowledgement)，下列哪些敘述是正確的?

- (a) To allow detection of a lost frame an ACK frame shall be returned immediately following a successfully received frame 為了偵測訊框丟失，一個節點成功接收訊框後，必須立即回覆ACK訊框
- (b) The gap between the received frame and ACK frame shall be SIFS. 收到訊框和傳送 ACK 訊框之間的間隔是 SIFS
- (c) The gap between the received frame and ACK frame shall be PIFS 收到訊框和傳送ACK訊框之間的間隔是PIFS
- (d) The gap between the received frame and ACK frame shall be DIFS 收到訊框和傳送ACK訊框之間的間隔是DIFS
- (e) The lack of an ACK frame means that an error has occurred 沒有收到回傳的ACK訊框表示錯誤發生

3.15. In IEEE 802.11 CSMA/CA protocol, which of the following frame types should be acknowledged with an ACK frame ?
有關於IEEE 802.11 CSMA/CA 協議，下列哪些種類的訊框需要一個ACK訊框？

- [ ] (a) Beacon 信標
- [x] (b) Data 數據
- [x] (c) Poll 輪詢
- [x] (d) Request 要求
- [x] (e) Response 回應

3.16. Which of the following are correct for the using of "Short IFS (SIFS)" in IEEE 802.11 CSMA/CA protocol ?
有關於在IEEE 802.11 CSMA/CA協議下，使用 Short IFS (SIFS) 時，下列敘述哪些是正確的?

- [x] (a) It is used for an ACK frame 使用在傳送 ACK 訊框
- [ ] (b) It is used for a Beacon frame 使用在傳送Beacon 訊框
- [x] (c) It is used for a CTS frame 使用在傳送 CTS 訊框
- [x] (d) It is used by a station responding to any polling 使用在工作站對輪詢做回應時
- [ ] (e) It is used only by the PCF to send any of the Contention Free Period frames 只有在PCF免競爭週期內傳送訊框時才使用

3.17. Which of the following are correct for the using of "PCF-IFS (PIFS)" in IEEE 802.11 CSMA/CA protocol ?
有關於在IEEE 802.11 CSMA/CA協議下，使用 PCF-IFS (PIFS)，下列敘述哪些是正確的?

- [ ] (a) It is used for an ACK frame 使用在傳送 ACK 訊框
- [x] (b) It is used only by the PCF to send any of the Contention Free Period frames 只有在 PCF 免競爭週期內傳送訊框時才使用
- [ ] (c) It is used only by the PCF to send any of the Contention Period frames 只有在PCF競爭週期內傳送訊框時才使用
- [x] (d) The PCF shall be allowed to transmit after it detects the medium free for the period PIFS PCF 在偵測到傳輸媒介閒置了PIFS的時間後，才被允許傳輸
- [ ] (e) The PCF shall be allowed to transmit after it detects the medium free for the period SIFS PCF 在偵測到傳輸媒介閒置了SIFS的時間後，才被允許傳輸

3.18. Which of the following are correct for the using of “DCF-IFS (DIFS)” in IEEE 802.11 CSMA/CA protocol ?
有關於在IEEE 802.11 CSMA/CA協議下，使用 DCF-IFS (DIFS) 時，下列敘述哪些是正確的?

- [ ] (a) It is used for an ACK frame 使用在傳送 ACK 訊框
- [ ] (b) It is used for a Beacon frame 使用在傳送 Beacon 訊框
- [ ] (c) It is used for a CTS frame 使用在傳送 CTS 訊框
- [x] (d) Used by the DCF to transmit asynchronous frames DCF在傳送非同步訊框時使用。
- [x] (e) A node using the DCF is allowed to transmit after it detects the medium free for the period DIFS, as long as it is not in a backoff period. 工作站只有在偵測到傳輸媒介持續空閒了DIFS(或以上) 的時間，且工作站不處於後退階段(backoff period)時, 才被允許傳輸。

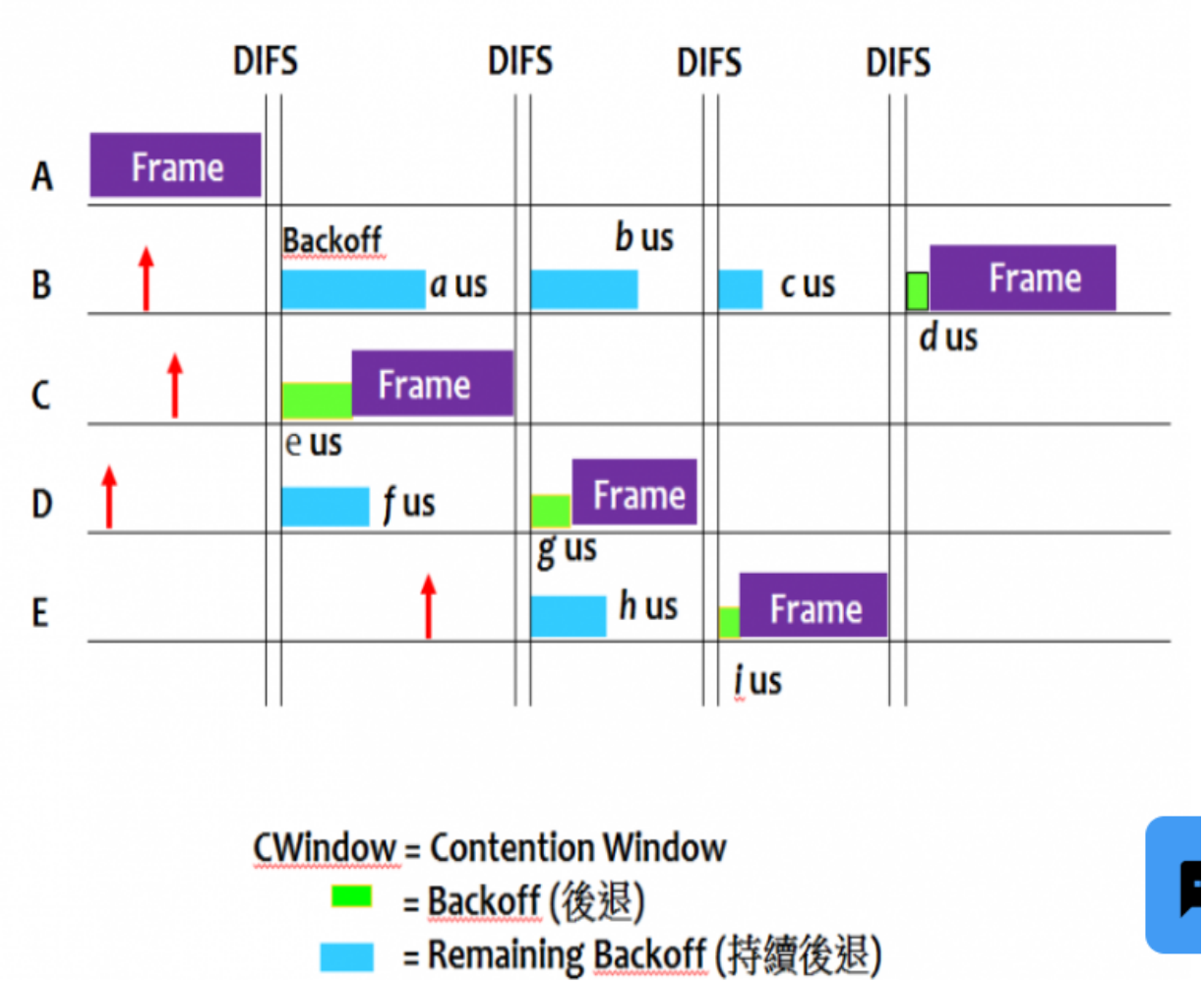
Wireless LAN 9

3.19. Which of the following statements about the CSMA/CA are correct ?
下列哪些有關於CSMA/CA協議的敘述是正確的 ?

- [x] (a) A station with a pending frame may transmit when it detects a free medium for greater than or equal to a DIFS time. 一個工作站偵測到傳輸媒介閒置的時間大於或等於 DIFS 之後，就可以傳送訊框
- [ ] (b) A station with a pending frame may transmit immediately when it detects the medium is free. 一個工作站偵測到傳輸媒介是閒置時，立即就可以傳送訊框
- [x] (c) If the medium is busy when a station desires to transmit a frame, the Random Backoff Time algorithm shall be followed after it detects a free medium for greater than or equal to a DIFS time. 假設傳輸介質是忙碌且有工作站想要傳輸訊框, 工作站持續偵測到傳輸媒介閒置了DIFS時間以後，會再啟動隨機退後時間演算法來延後傳送時間
- [ ] (d) If the medium is busy when a station desires to transmit a frame, the station can transmit the frame when it detects a free medium for greater than or equal to a DIFS time. 假設傳輸介質是忙碌且有工作站想要傳輸訊框, 偵測到傳輸媒介是閒置以後，便可以傳輸訊框
- [ ] (e) In CSMA/CA protocol, no packet collision will happen as the “collision avoidance” mechanism is used. CSMA/CA 協議因為使用了碰撞避免機制，所以不會發生訊框碰撞的情形

Wireless LAN 10

3.20. Consider the random backoff procedure in the CSMA/CA protocol. For the following figure, assume th e red arrow indicates the time of a station wishing to send a frame, and the backoff time for stations B,C,D, E, are 19us, 10us, 15us, and 7 us, respectively. Then based on the backoff procedure, please indicate the value for each of the following valuables:
考慮CSMA/CA協議的隨機後退機制。關於下圖，假設紅色箭頭描述了節點想傳送訊框的時間，而節點B、C、D、E各別計算出來的後退時間是19us、10us、15us和 7 us，則根據倒退程序方法，請填入下列變數的值 (請填入一整數):



CWindow = Contention Window
= Backoff (後退)
= Remaining Backoff (持續後退)

a 19

b 9

c 4

d 2

e 10

f 15

g 5

h 7

i 2

Wireless LAN 12

3.21. Which of the following statements are correct about the “Point Coordination Function (PCF)” ?
下列哪些關於集中式協調功能(PCF)的敘述是正確的?

(a) The PCF provides contention free services. PCF 提供免競爭的傳輸服務

(b) Each station must one by one become the Point Coordinator (PC), which generates the Superframe. 每個工作站必須輪流成為中樞協調者(Point Coordinator, PC)，負責產生超級訊框(Superframe)

(c) Not all stations must be capable of becoming the PC and transmitting PCF data frames. 不是所有工作站都要有能力成為中樞協調者(PC)

(d) The Superframe consists of a Contention Free period and a Contention Period. 超級訊框(Superframe)包含免競爭週期和競爭週期

(e) The length of a Superframe is a manageable parameter but that of the contention free period is fixed on a per Superframe basis. 超級訊框的長度是一個可調的參數，但每個超級訊框內的免競爭週期長度都必須一樣

送出檢查 隱藏答案

Wireless LAN 14

3.22. Which of the following relationship is correct for the “values” of the three priority levels: SIFS, PIFS, and DIFS, defined in IEEE 802.11 CSMA/CA protocol ?
IEEE 802.11 CSMA/CA 協議定義了三種優先權級別：SIFS、PIFS和DIFS，有關於這三種 “數值”大小關係，下列哪一個敘述是正確的?

(a) PIFS < SIFS < DIFS

(b) SIFS < PIFS < DIFS

(c) DIFS < PIFS < SIFS

(d) DIFS < SIFS < PIFS

(e) SIFS < DIFS < PIFS