

(S/M)/CA

S-72.3240 Wireless Personal, Local, Metropolitan, and Wide Area Networks

Exam 1.9.2006 13-16

1. Indicate whether the following statements are TRUE or FALSE (for each statement, correct answer: 1p, wrong answer: -1p, no answer: 0p):

- a) A Bluetooth piconet contains one master device and up to seven slave devices. T
- b) In a WLAN, SSID means "alphanumeric network name". T
- c) In a WLAN, the RTS/CTS scheme cannot be used because of the hidden node problem. T
- d) Inter-access point protocol (IAPP) offers mobility in the OSI application layer. F
- e) Inter-access point protocol (IAPP) offers mobility in the OSI network layer.
- f) "Voice over RTP over UDP over IP" makes sense and is being used as a VoIP solution. T
- g) "Voice over RTP over TCP over IP" makes sense and is being used as a VoIP solution. F
- h) The IEEE 802.16 (WiMAX) uplink subframe contains a contention slot for initial ranging.
- i) The WiMAX uplink subframe contains a contention slot for bandwidth requests.
- j) The acronym UMA means Unlicensed Mobile Access.

2. Please list the missing words or expressions on your exam paper:

In wireless medium access, (a) carrier sensing is based on using a (b) network allocation vector. An IPv4 address consists of (c) 32 bits, whereas a MAC address consists of (d) 48 bits. TDD and FDD are (e) duplex methods. In WiMAX, (f) NAV means including several MAC PDUs in a DL or UL burst, and (g) MAC means including several MAC SDUs in a MAC PDU. WiMAX offers the following mechanisms for dynamically managing QoS and bandwidth: In the PHY layer (h) NAV, in the MAC layer (i) MAC, and at higher protocol layers (j) MAC. (Use several words for describing these mechanisms.)

3. Explain the Bluetooth frequency hopping access scheme, including the adaptive frequency hopping (AFH) feature.

4. List the four main security requirements of a secure transmission system. Explain with four examples how these requirements can be fulfilled in a WLAN system using the functionality provided by WEP or WPA.

5. In the IEEE 802.11g physical layer, the OFDM signal consists of 48 data + 4 pilot subcarriers carrying OFDM symbols of length $4 \mu s$. The guard time for preventing intersymbol interference is $0.8 \mu s$. Please calculate the following (remember to show all calculation steps):

- a) Calculate the subcarrier spacing (i.e. frequency interval between adjacent subcarriers).
- b) Calculate or estimate the bandwidth of the OFDM signal.
- c) Assuming 64-QAM, how many bits/symbol does each subcarrier carry?
- d) Assuming 64-QAM, how many data bits does each OFDM symbol carry?
- e) Assuming 64-QAM and $\frac{3}{4}$ coding rate, calculate the usable data bit rate (i.e. data bit rate before coding or after decoding).

