COMP4336/9336 Mobile data networking
W5 Quiz: Bluetooth

Q1. Bluetooth can in

a) 802.11a
b) 802.11ax
c) 802.11ac
d) 802.11af
e) 802.11ad

A1. Bluetooth operates within 2.4GHz band and hence can interfere with any WiFi that also operates within 2.4GHz band. 802.11ax can operate at either 2.4 GHz or 5GHz band, so BT can interfere with 11ax.

Q2. If 4-slot packets were allowed in Bluetooth, we could not guarantee

a) that the master starts in even numbered slots only
b) that the slave starts in even numbered slots only
c) interference-free communication
d) error-free communication
e) timely completion of the packets

A2. Use of even number of slots would break the rule that Master always start transmission in even-numbered slots and is always at odd-numbered slots.

Q3. With the Enhanced Data Rate (EDR) option, Bluetooth Classic can transmit in excess of 1Mbps by

a) Shortening the guard interval
b) Using more efficient error correction codes
c) Using more advanced modulation techniques
d) Implementing MIMO
e) Using Gaussian FSK

A3.

2 Mbps is achieved by using DQPSK (2 bits per symbol) and 3 Mbps with 8DPSK (3 bits per symbol).

Q4. In Bluetooth, a 3-bit address is used to identify the

a) Parked devices
b) Active devices
c) Both active and parked devices
d) Piconet

e) Scatternet

A4. 3-bit = 8 addresses, 7 for active slaves and 1 for the master.

Q5. If Bluetooth was [illegible]ck, how many clock ticks would be required to manage a slot?

A. 1/6400 = 15[illegible] to manage a 625 us slot, we need 625/156.25 = 4 clock ticks.

Q6. With Gaussian FSK,

a) Frequencies do not change
b) Frequencies switch rather smoothly from one value to the other
c) Many frequencies are used, which have a Gaussian distribution
d) Both amplitude and frequency are used for modulation
e) Both phase and amplitude are used for modulation

A6. The Gaussian here refers to the shape of the frequency change curve for the binary FSK, which is very smooth and looks like a Gaussian distribution.

Q7. How many slots are occupied to transmit a Bluetooth Basic Rate packet carrying 63 bytes of data, while carrying a 9-byte piconet identifier as its Access Code?

A7. Non-payload bits = 9x8+54 = 126 bits
63-byte data = 63x8 = 504 bits of payload
Total packet size = 504+126 = 630 bits, which cannot fit within one slot (slot = 625 us = 625 bits maximum). 2 slots are needed, but the third slot must be wasted because 3-slot packets are not allowed in Bluetooth. These 3 slots are occupied to transmit this packet.

Q8. What would be the maximum total number of non-payload bits in a Bluetooth Classic Basic Rate packet if the header was encoded with 2/3 rate FEC?

a) 84
b) 86
c) 89
d) 95
e) 99

A8. Header is 18 bits without FEC coding. With 2/3 rate FEC, total number of bits in the encoded header = 18 x (3/2) = 27 bits. Total non-payload bits = 27 (header) + 72 (access code) = 99 bits

Q9. Which of the following wireless technologies use different modulations for different parts (fields) of the same packet?

a) WiFi 802.11ad
b) WiFi 802.11af
c) WiFi 802.11ax
d) 1 Mbps Blue
e) 2 Mbps Blu

A9. BT EDR uses G e and Header fields and then switch to either DQPSK (2 Mbps) o r the remaining fields of the packet.

Q10. Bluetooth 5 acl y

a) using error detection and correction
b) using higher transmission powers
c) using a more sensitive receiver circuit that can decode symbols at a much lower received power
d) using a wider channel bandwidth
e) using a narrower channel bandwidth

A10. Longer range means weaker signal and higher bit error rate. To address the bir error rate problem, error correcting codes are used.

End of Quiz-5