

# SSY145 Wireless Networks

## Quiz A3 Answer Key

Date: April 16, 2020

The solutions are marked in **boldface**.

1. Suppose you have a mobile device supporting LTE Release 10 and you are in a city with LTE Release 8 base stations. Which of the following scenarios are possible?

- (a) Mobile device will fail to connect to the base station.
- (b) Mobile device will connect to base station and operate normally.**
- (c) Mobile device will connect to base station only if it is an Apple device.
- (d) The base station will update itself to LTE Release 10 since the mobile device is LTE Release 10.

Motivation: A Release 10 terminal can directly connect to a network of an earlier release, and a Release 8/9 terminal can connect to a network supporting the new enhancements. Hence, an operator can deploy a Release 8 network and later, when the need arises, upgrade to Release 10 functionality where needed.

2. Which of the following is an LTE Release 10 enhancement?

- (a) Possibility to have control signals for different cell layers separated in frequency or time.**

**Motivation: LTE Release 10 provides enhancements to separate the control signaling for the different cell layers in either the frequency or time domain.**

- (b) Support for 4-layer spatially multiplexed downlink transmission using multiple antennas.

Motivation: LTE supports a rich set of multi-antenna transmission techniques already in the first release. In addition, downlink codebook-based precoding, including the possibility for multilayer transmission (spatial multiplexing) with up to four layers, is supported in LTE Release 8.

- (c) Capability to have an aggregated transmission bandwidth of 200 MHz.

Motivation: Up to 100 MHz.

- (d) None of these choices.

3. Which of the following is/are false about diversity?

- (a) Independent signal paths have a high probability of experiencing deep fades simultaneously.**

**Motivation: Independent signal paths have a low probability of experiencing deep fades simultaneously.**

- (b) The output SNR with Selection Combining improves linearly with the number of diversity branches.**

**Motivation: The output SNR with Maximal-Ratio Combining improves linearly with the number of diversity branches.**

- (c) Independent fading paths can be achieved by separating the signal in time, frequency, space, and polarization, etc.
- (d) **To realize diversity, the same information should be sent over dependently fading radio.**

**Motivation:** The basic concept is to send the same information over independently fading radio.

4. A channel introduces a lot of amplitude noise but almost no phase noise. Which of the following constellations is(are) suitable for this channel?

- (a) **QPSK**
- (b) 32-QAM
- (c) **16-PSK**
- (d) 8-QAM

Motivation: Since this channel has almost no phase noise, phase shift keying constellation is robust against amplitude noise.