Exam 2017/2018 Part 2

Question 1

Duplex transmission consists in the transference of data in both directions: uplink and downlink. This means the creating of a channel for each direction.

There are two methods of implementing a duplex system.

The first is **FDD**, where the wireless link is separated into frequency bands. Given this, bands are assigned to uplink and downlink channels. Peers therefore communicate in both directions using different bands.

The second is **TDD**, where the wireless link is separated into timeslots. Then, timeslots are assigned to the transmitter for each direction. Peers use the same frequency band but at different times.

In terms of **interference**, FDD requires guard-bands while TDD requires guard-intervals. As for **channel estimation**, FDD requires estimation for both directions, while TDD it is the same for both (same frequency). FDD demands **frequency planning**, using pairs of bands for each transmitter, while TDD does not. **Asymmetric allocation** of capacity is easier in TDD, where you can just give more channels to one direction, while you cannot do that for FDD (different frequencies may not be supported).

Question 2

The **LTE Admission Control** admits that a new arrival is characterised by Rj bit/s, requiring Nj blocks/frames. If the are blocks available, considering the ones that are already assigned, then the call is accepted. This blocks are characterised by the frequency and the frame period.

The **UMTS Admission Control** admits that a new arrival is characterised by Rj bit/s. Depending on the transmission, a new arrival is characterised by a load factor, that is related to the interference cause by the transmissions. If the total load of the system is smaller than a threshold set previously, then the call is accepted.

Question 3

5G is a response to a set of requirements like the ever-growing bandwidth requirements, low delay, and massive connected devices. For this matter, 3 broad categories where created:

- eMBB (Enhanced Mobile Broadband), with high user data rates, with wide-area coverage (high mobility), or hotspot coverage (high bitrate).

- URLLC (Ultra-Reliable and Low Latency Communications), with very high requirements for RMA and latency.

- mMTC (Massive Machine Type Communications), supporting a very large number of devices, characterised by low-volume, non-delay-sensitive data. They need to be low cost and have a very long battery life.

Question 4

Mobility management consists in enabling the network to be aware of the terminals location. Maintains the route/connection to the terminal when it moves.

It consists in 2 main functions, location management and hand-off management.

In **location management**, the terminal informs the network about about its current Access Point regularly.

In **hand-off management**, the terminal maintains network connection when it moves. Consists in 3 main steps:

- Initiation, need to hand-off initiation.

- New route / connection generation, where radio resources are found for the hand-off connection and routing operations are performed.

- Data-flow control, consisting on the delivery of data from the old to the new path, maintaining QoS.