Mobsys

Exam 2023

Duration: 2 hours

All the distributed documents in the course (lectures and labs) and personal notes are authorized. Books are forbidden.

Part I

Exercise n°1 (Radio Access Network: Architecture and Physical layer): 6.5 points

1. Why is the 4G system used jointly with the 5G air interface?
2. What is the reason for configuring more than one Synchronization Signal Block (SSB)
3. What is the purpose of the Physical Downlink Control Channel (PDCCH)?
4. Should it be possible to support lower air-interface latency with a 120 kHz or 30 kHz subcarrier spacing and why?
5. What is the main reason for allowing for the possibility of splitting spectrum into so-called "Bandwidth Parts"?
6. What is the purpose of the F1 interface?

Excercies n°2 (Radio Access Network : higher layers): 6.5 points

1. What are the dimensions when increasing capacity in a cellular system? How does the data rate capacity of a base station increase from 4G to 5G?
2. What are the benefits and drawback of RAN functional split? What are the standardized splits, give their names as well as the components/layers involved.
3. What are the overall UE registration steps to a 5G network?
4. Draw a message sequence chart for the RACH and the RRC Connection procedures and provide a mapping for each messages to the logical channels and RLC mode.
5. How does the MAC layer dynamically schedule users over different resource blocks? Describe and provide an example.

Exercise n°3 (Core Network) : 7 points

- What are the roles of NSSF and NRF? How do they interact with AMF and what for?
- What is the role of the PFCP protocol? Which entities use this protocol?

The following table has been extracted from UPF

TEID	@IPsrc	Action 1	Action 2	Action 3
98	-	Remove GTP header and IP outerheader	Forward (Core)	--
-	12.1.1.222	Add GTP header (TEID = 888, QFI=5)	Add IP outerheader IPdst = 192.168.8.1 & IPsrc = 192.168.8.2	Forward (access)

775	-	Remove GTP header and IP outerheader	Forward (Core)	
-	12.1.0.1	Add GTP header (TEID = 888, QFI=5)	Add IP outerheader IPdst = 192.168.8.89 & IPsrc = 192.168.8.2	Forward (access)

- Draw the network topology (i.e. UPF(s), UE(s) gNB(s)) ? Indicate the IP address of each entity and the TEIDs. Which entity helped the UPF to fill this table?
- Give an interpretation of each line.