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Quiz #7 questions on Introduction to 5G – with Applications

1. **Mention at least two new areas for which 5G might play an important role beyond mobile broadband.**   e_Health, Internet of Things, industrial 2.0

2. **What does xMBB, mMTC, and URLLC stand for?**
   Enhance mobile broadband communication, Massive Machine Type Communications, Ultra-Reliable Low-Latency Communication

3. **Mention at least two novel techniques that 5G will deploy to meet the x1000 higher mobile data volume compared to 4G.** Throughput, Mobile Data Volume
   Massive MIMO, Ultra-Dense Networks, Higher Frequencies

4. **What challenges and opportunities are there with mm-wave communications, mention at least one opportunity and one challenge?**
   Worse attenuation, but wide system bandwidths available
   Worse multipath and large shadowing/blocking effects, but possibility for dense reuse

5. **Which is the most important organization for standardization of mobile systems, and spectrum allocation, respectively?**
   3GPP for standardization
   ITU-IMT spectrum access

6. **Mention at least two meanings of 'X' in V2X.**
   V2I (Vehicle-to-Infrastructure), V2V (Vehicle-to-vehicle), V2P (Vehicle-to-Pedestrian)
   V2D (Vehicle-to-device)

7. **Mention at least two functions in Intelligent Transportation Systems (ITS).**
   Forward collision warning, Lane change warning/blind spot warning, Emergency Electric Brake Light Warning, Platooning

8. **Mention at least two use case classes, as defined in the 5GCAR project, in which multimedia might play an important role. Please motivate.**
   1-Lane Merge Coordination: Connected vehicles make room for an entering vehicle by help of the cammer that exist in the roud.
   2-Vulnerable Road User Protection: Pedestrian_UE send information to Base station and base station warning the car to slow down and watch the pedestian (optionaly warning the pedestrian), 3- Autonomous Navigation: use the data from cloud to updata the information in high definition map about traffice and weather situation. 4- Remote Driving: also ues the cloud to remot control motion in selfe driving car in critical situations

9. **What is the basic idea behind Integrated Moving Networks?**
   Mutual opportunities for both enhanced mobile networks and ITS services!
   • Using moving base stations to serve both in-vehicle and out-of-vehicle users
   • Spider (soft) handover schemes • Coordinated MultiPoint (CoMP)-like schemes

10. **Why are business models important to consider when designing 5G networks to connect new industries, such as automotive?**
    The value of change to new technology should be consider to creat an ecosystem and integrated with the old sysrtms so that can make good provet to the operator and open new business model for them so that can encourage them to move to new one.