Introduction to Wireless and Mobile Networking
Midterm Exam 2024/12/17
Exam Time: 14:20~15:20, 可以帶 1 張 A4 大小的筆記 (one A4 cheat sheet)
Total 105 points

I. Wi-Fi Recent Activities [12%]

(a) In the next-generation Wi-Fi (e.g. IEEE 802.11be, IEEE 802.11bn), we would like to increase data rate. Describe two high-data-rate design [6%]

(b) What are the benefits of randomization of MAC address in IEEE 802.11? What are the tradeoffs? [6%]

II. Telecommunications Networks [20%]

(a) When do you need authentication in GSM system? Where does the security key stored? Why don't you transmit the security key over the air during authentication process? [6%]

(b) Why do we need HO_margin (handover margin) during the handover process? [6%]

(c) Draw and compare the signaling flows between mobile terminated call and mobile originated call in the air interface between MS and BS. Why are there differences? [8%]

III Multihop Relay [24%]

(a) Explain how expanding ring search work in AODV. Describe a scenario in which using expanding ring search will performance better (compared to the case when it is not used) [6%]

(b) How does Optimized Link State Routing (OLSR) improve its efficiency in multihop relay network? Do you think it's more suitable for fixed wireless relay or MANET with higher node mobility? Why? [6%]

(c) Compare DSDV and DSR. What are the main differences? In which scenario will you prefer to use DSR? In which scenario will you prefer to use DSDV? [6%]

(d) Describe what might be the performance issue when 802.11 nodes running TCP over mobile ad hoc networks using AODV as routing protocol. [6%]

IV. TCP [24%]

(a) Explain how Snoop improve the downlink TCP performance. [6%]

(b) What should the Snoop agent do to improve uplink TCP performance? What's the differences between the uplink case compared to the downlink scenario? If you think it's the same, please explain why. If you think Snoop cannot improve uplink TCP performance, please explain why. [6%]

(c) Please describe the design tradeoffs for applying re-transmission in (i) link layer only (ii) transport layer only (iii) both link layer and transport layer [6%]

(d) How does I-TCP improve TCP performance in wireless/mobile environment? [6%]

V. 5G/6G [25%]

(a) Explain the differences between 5G SA and NSA. What are the pros and cons of deploying SA and NSA? [5%]

(b) Explain the benefits of flexible numerology in 5G standard [5%]

(c) In NGMN 6G use cases, "robot network fabric" and "interacting cobots" are the two cases related to robots. How will you design differently for those two cases? [5%]

(d) Describe the challenges for 6G NTN HAPS (High-altitude platform station) and LEO (Low Earth Orbit) satellites. [5%]

(e) Describe the two aspects of AI/ML-related design in edge computing and provide examples to illustrate the concepts. [5%]