IN5420 - Distributed Blockchain Technologies
Spring 2022

Oral Examination, June 3, 2022

Question Pool

(l) Long question
(m) Medium question
(s) Short question

General

1. What are the advantages and disadvantages of using blockchain technologies? **(l)**
2. When should blockchain be used and when should it not? **(m)**
3. What is the main difference between blockchain and a distributed database? **(s)**
4. In your opinion, what will be the future of blockchain technologies? **(s)**

Bitcoin

5. How are blocks proposed in Bitcoin? **(l)**
6. How is consensus achieved in Bitcoin? **(m)**
7. Explain the Merkle tree data structure and the reasons it is used in Bitcoin. **(m)**
8. What are the incentives for miners to participate in the Bitcoin network? **(m)**

Beyond Bitcoin

9. What are the general limitations of Bitcoin? List at least three. **(s)**

Byzantine Fault Tolerance

10. What is Byzantine behaviour? **(s)**
11. What does it mean to tolerate byzantine faults in a distributed system? **(s)**
12. What are the main differences between classic BFT consensus and Nakamoto consensus? **(m)**

Blockchain Networking

13. What can affect propagation delays for transactions and blocks, and what are the impacts of higher delays? **(l)**
14. Why knowledge of the network topology may affect the security of the system? **(s)**

Ethereum

15. What are the main differences between Ethereum and Bitcoin? **(m)**
16. Why is it possible to have blocks every ~14 seconds in Ethereum? **(s)**
17. What data structure is used in Ethereum and why? **(s)**
18. Why would Merkle Trees not be efficient in Ethereum? **(s)**

Hyperledger Fabric

19. What are the main differences between permissioned and permissionless blockchain platforms? **(m)**
20. What are the advantages and disadvantages of using Hyperledger Fabric instead of Ethereum for implementing decentralized applications? **(l)**

Alternative Consensus

21. What problem in Bitcoin motivated Bitcoin-NG? **(s)**
22. What is the main difference between Bitcoin and Bitcoin-NG? **(s)**
23. How do incentives work in Bitcoin-NG? **(s)**

IOTA

24. Explain the concept of Directed Acyclic Graph in IOTA. **(m)**
25. How are transactions validated in IOTA and when? **(s)**
26. Why does IOTA achieve a higher rate of transactions compared to Bitcoin or Ethereum? **(s)**

Zerocash

27. What are zero-knowledge proofs and how are they used in blockchain? **(m)**

Scaling Blockchain

28. What is layer-2 scaling? **(m)**

Smart Contracts

29. What are the challenges of executing Smart Contracts in blockchain platforms? **(l)**

Blockchain Storage

30. Why is off-chain decentralized storage necessary? **(s)**
31. How off-chain decentralized storage, such as IPFS, is usually integrated into blockchain? **(s)**

Applications

32. From the applications studied in the course (Healthcare, Machine Learning, and Supply Chain), which do you think has the most potential to be actually deployed in the real-world and why? **(m)**

Presentation

33. What did you learn about making presentations in this course? **(s)**
34. What would you do differently if you had to make the same presentation you did in the course again? **(s)**