"Approve"
Dean of the Faculty of
“Telecommunications Technologies”
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Final questions on the discipline "IoT: communication and protocols" for students of the faculty of Telecommunication Technologies of the educational direction “Telecommunication Technologies (Telecommunications)”

Question Group 1

1. What is the Internet of Things? Describe the ecosystem of consumer IoT devices.
2. What is the Internet of Things? The evolutionary transition from the "Internet of People" to the "Internet of Things."
3. What is meant by the term "connected thing" in relation to the Internet of Things?
4. What is the Internet of Things? Key factors that have driven the development of the IoT.
5. What is the Internet of Things? Key components of the IoT.
6. What is the Internet of Things? IoT development paths.
7. What is the Internet of Things? IoT enablers. IoT characteristics.
8. What is the Internet of Things? IoT development trends.
9. What is standardization in the context of the Internet of Things, and why is it necessary? Describe the difference between IT networks and IoT networks.
10. Which international organizations are developing standards for the IoT? Provide examples
11. What challenges associated with IoT networks have led to the emergence of new architectural models?
12. Describe the goals of the oneM2M standard and list the three main IoT layers in oneM2M.
13. Describe the oneM2M architecture and describe the functions of the main layers.
14. What components are included in the service layer of the oneM2M architecture?
15. Describe the IoTWF architecture and briefly explain the functions of the main layers.
16. Describe the IoT World Forum architecture and list the functions of lower layers 1-4.
17. Describe the IoT World Forum architecture and list the functions of upper layers 4-7.
18. List the layers of the IoTWF architecture and describe the nature of communication in the IoTWF model.
19. Describe the advantages of the IoTWF architecture. Which layers in the IoTWF model are IT and OT technologies responsible for?
20. IoT standards developed by ISO (ISO/IEC JTC 1/SC 41 and others)
21. IoT Reference Model (Rec. Y.2060)
22. Describe the concepts of "Physical Things" and "Virtual Things" in the ITU-T Y.2060 standard.
23. Describe the difference between the concepts of "Internet of Things" and "Internet Thing" according to ITU standards.
24. What is meant by a smart object in the IoT? What are sensors used for? What functions do they perform?
25. What is meant by a smart object in the IoT? What are sensors used for? What functions do they perform?

26. What is meant by a smart object in the IoT? What is the difference between sensors and sensors? What functions do they perform?
27. Describe the ways to classify sensors.
28. Describe the ways to classify sensors.
29. What types of sensors are used in smartphones? What functions do they perform?
30. What types of sensors are used in smartphones? What functions do they perform?
31. What is meant by a smart object in the IoT? What are actuators used for? What functions do they perform?
32. What is meant by a smart object in the IoT? What is the difference between a sensor and an actuator? What functions do they perform?
33. What is meant by a smart object in the IoT? What is the difference between a sensor and an actuator? What functions do they perform?
34. Describe how the functionality of sensors and actuators compares with the human senses.
35. What are actuators used for? Describe the classification methods for actuators.
36. What is meant by smart sensors? What place do smart objects occupy in the IoT architecture?
37. What is meant by smart actuators? What place do smart objects occupy in the IoT architecture?
38. What is meant by a smart object in the IoT? Communication Features of Smart Objects
39. Communication Criteria in the IoT for Evaluating Various Use Cases for IoT Device Connection Technologies
40. Classification of IoT Device Connection Technologies by Communication Range
41. Describe the role of LTE-M technology in the IoT architecture, and at what level of the IoT architecture does this technology operate?
42. Describe the role of NB-IoT technology in the IoT architecture, and at what level of the IoT architecture does this technology operate?
43. General NB-IoT architecture. Which LTE cellular infrastructure devices are used to implement NB-IoT?
44. List and describe the functions of the main elements of the NB-IoT architecture.
45. Describe the operation of NB-IoT over an LTE network.
46. Provide a general description of LTE-M technology. What LTE cellular infrastructure devices are used to implement LTE-M?
47. Provide and describe the structure of the LTE-M network.
48. List and describe the functions of the main elements of the LTE-M architecture.
49. Describe the operation of LTE-M over an LTE network.
50. Describe the role of LoRaWAN technology in IoT architecture, and at what level of the IoT architecture does this technology operate?
51. Describe the role of IEEE 802.15.4 technology in IoT architecture, and at what level of the IoT architecture does this technology operate?
52. Provide a general description of LoRaWAN technology.
53. Provide a diagram and describe the layers of the LoRaWAN architecture.
54. Provide a diagram and describe the main network elements of the LoRaWAN architecture.
55. Describe the operation of LoRaWAN.
56. Provide a general description of IEEE 802.15.4 technology, and describe the main network topologies used.
57. Describe the operation of IEEE 802.15.4.

Question Group 2

1. Describe the specific application of the IP protocol in the IoT.
2. Describe why IP is important for the IoT. What limitations of IoT devices make using classic IP difficult?
3. What is 6LoWPAN technology? What problem does it solve? What place does it occupy in the IoT architecture?
4. What is the RPL protocol and what types of networks is it intended for? What place does it occupy in the IoT architecture?
5. Describe how the IP protocol should be optimized for the IoT architecture.
6. Compare the IoT protocol stack using 6LoWPAN and TCP/IP.
7. How does IPv6 packet adaptation occur in 6LoWPAN? What header compression mechanisms are used in 6LoWPAN?
8. How does IPv6 packet adaptation occur in 6LoWPAN? What is packet fragmentation in 6LoWPAN and when is it necessary?
9. How is the RPL network topology structured? What is the difference between DAG and DODAG?
10. What message types are used in RPL? Describe their purpose.
11. What is the difference between 6LoWPAN and traditional IPv6? How are 6LoWPAN networks integrated with the Internet?
12. How is upstream and downstream routing formed in RPL?
13. What are application protocols in IoT architecture? What tasks do the CoAP and MQTT protocols solve?
14. What is the CoAP protocol? What is the main difference between CoAP and MQTT?
15. Purpose of the CoAP protocol. What message types are used in CoAP?
16. List the message types used in CoAP. CoAP message format.
17. How does the client-server model work in CoAP? What transport protocols does CoAP run on?
18. Describe the client-server interaction in CoAP using the example of a node → gateway → CoAP cloud scenario.
19. How does the publish/subscribe model work in the MQTT protocol? What transport protocols does MQTT use?
20. What is the publish/subscribe model and model in the MQTT protocol? What is an MQTT broker and what role does it play?
21. What QoS levels exist in MQTT? What are the advantages of MQTT when working with unstable networks?
22. What problems do the CoAP and MQTT protocols solve? In which IoT scenarios is CoAP used, and where is MQTT used?
23. Describe how sensor → cloud data transfer is implemented using MQTT.
24. What limitations of IoT networks affect the use of IP network transport mechanisms? Describe the criteria for selecting IoT application protocols.
25. Describe the categories of IoT application protocols for selecting a method for transporting IoT applications.
26. Functions of application protocols in the IoT. Classification of application protocol use cases in the IoT.
27. Causes of IoT signal degradation during transmission over telecommunication channels.

28. Interference and distortion during IoT signal transmission over telecommunication channels.
29. What are additive noise and impulse interference? What impact do they have on IoT signals during transmission over telecommunication channels?
30. What are co-channel and mutual interference? What impact do they have on IoT signals during transmission over telecommunication channels?
31. What are multipath interference, slow fading (shadowing), and fast fading? Their impact on IoT signals during transmission over telecommunication channels.
32. What are nonlinear distortions? What impact do they have on IoT signals during transmission over telecommunication channels? 33. What are delays and jitter? How do they affect IoT signals when transmitted over telecommunications channels?

Question Group 3

1. Purpose of NFC technology. Service provisioning model
2. Purpose of NFC technology. NFC's place in NGN network architecture
3. What is IEEE 802.15.4 and what role does it play in IoT standardization?
4. Protocol stack of wireless sensor networks. Comparison of the ZigBee standard with the IEEE 802.15.4 standard
5. Protocol stack of wireless sensor networks. Differences between the ZigBee standard and the IEEE 802.15.4 standard
6. Clustering in wireless sensor networks. ZigBee - an example of a network structure, organization method, and disadvantages
7. Describe the goals of the ZigBee Alliance and their standard
8. Describe examples of NFC technology applications in various fields.
9. Purpose of NFC technology. Communication in the NFC protocol
10. Purpose of NFC technology. NFC protocol - operating modes
11. What is the purpose of the RFID radio identification system?
12. RFID System Architecture. What is an RFID TAG?
13. What components are included in an RFID system?
14. How is an RFID tag constructed? What types of tags are there?
15. RFID System Architecture. RFID Reader Functions
16. What is the status of RFID technology standardization?
17. Purpose and Composition of a UHF Transponder in an RFID System
18. Describe the functions and design of RFID system readers.
19. Provide examples of RFID technology applications in various fields.
20. List digital electronics interfaces for transferring large amounts of data between device components. What is the MIPI Alliance and what is its main purpose?
21. List digital electronics interfaces for transferring large amounts of data between device components. MIPI Application Areas
22. Sensors for Automotive Vision and Safety. Explain the meaning of the terms ADAS (SoC), LiDAR, and TOF (time of flight).
23. How do MIPI protocols differ from USB, HDMI, and LVDS in terms of power efficiency and scalability?
24. What key features of the MIPI architecture enable high power efficiency?
25. In what industries is the MIPI protocol used today, besides mobile devices?
26. What is the UniPro protocol/interface, and what types of systems is it intended for?
27. What interaction principles are used between the various components of MIPI interfaces?

28. What layers does the UniPro protocol architecture include, and what functions do they perform?
29. How does the UniPro protocol handle errors during data transfer, and what mechanisms does it use?
30. What media access control methods does the UniPro protocol use?
31. What is the difference between asynchronous and synchronous data transfer modes in the UniPro protocol?
32. Which layer of the UniPro protocol architecture is responsible for routing data between devices?
33. How does the UniPro protocol achieve high data transfer rates compared to SPMI?
34. What is the role of API in the UniPro protocol software layer?
35. What is the main purpose of the SPMI protocol?
36. What are the main advantages of using SPMI in mobile and embedded systems?
37. What error correction mechanisms are included in the SPMI protocol?
38. Why is unique device addressing important in data transfer protocols such as UniPro and SPMI?
39. What are the main limitations of SPMI compared to UniPro in terms of supporting the number of connected devices?
40. How is interaction between master and slave devices organized in SPMI?
41. Cyberspatial Systems – Definition. List the main components from an IoT perspective.
42. Describe the features of cyberspatial systems in the IoT.
43. Describe the main security threats to IoT devices. Provide examples.
44. List the layers of IoT architecture as a cyberspace system. Describe the main vulnerabilities of IoT devices.
45. Describe the types of attacks on IoT devices.
46. Describe the key security principles that should be considered when designing IoT devices.
47. Describe what DDoS protection methods can be used to protect IoT devices.
48. Explain what authentication and authorization are in the context of IoT, and how do they differ?
49. Explain how data encryption can help ensure the security of IoT devices and transmitted information.
50. Explain the role of software updates and patches in maintaining the security of IoT devices.
51. Explain how to assess the security level of an IoT device during its development and operation.
52. Describe recommendations for ensuring the physical security of IoT devices.
53. List the layers of IoT architecture as a cyberspace system.
54. What are the main security threats to IoT devices? Provide examples.
55. IoT architecture layers from a cyberspace systems perspective
56. What is network-level security, and how does it apply to IoT architecture?

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