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Nokia Bell Labs End-to-End 5G Foundation Certification Exam

Nokia BL00100-101-E

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Topic Break Down

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QUESTION NO: 1

Which of the following statements are applicable to the technology of massive MIMO?

(Select 3)

A. Several data flows are sent at the same time on the same frequency.

B. The signals on each antenna are made orthogonal.

C. The data flows are sent at the same time on different frequencies.

D. Transmit diversity is used in case of poor radio conditions.

ANSWER: A B D

Explanation:

Massive MIMO uses a large number of base-station antenna elements together with channel-state information and precoding to exploit the spatial dimension of the radio channel. This makes it possible for several independently encoded data flows to be transmitted concurrently in the same time-frequency resources. Rather than separating users or layers only by time or frequency, the base station spatially focuses transmissions toward the intended devices, increasing spectral efficiency and enabling multi-user MIMO operation.

The antenna-array signals are precoded so that the resulting transmitted layers or beams are spatially separable, often described as being orthogonal (or near-orthogonal) from the receivers' channel perspective. This spatial orthogonality allows concurrent flows on the same frequency while controlling inter-user interference. The large antenna array also provides diversity gain. Where propagation conditions are challenging, transmit-diversity operation can improve link robustness by conveying information through multiple antenna paths, reducing sensitivity to a deep fade on any individual path.

These capabilities—spatial multiplexing, beamforming/precoding, and diversity—are central benefits of massive MIMO in 5G radio systems. 3GPP specifies multi-antenna transmission and precoding procedures for NR in 3GPP TS 38.214. Nokia also describes massive MIMO as using antenna arrays and beamforming to increase capacity and coverage in its Massive MIMO overview.

QUESTION NO: 2

What is the "sweet spot" for Industry 4.0?

A. The "sweet spot" for industry 4.0 is the intersection of URLLC, eMBB and mMTC.

B. The "sweet spot" for industry 4.0 is a double-digit revenue growth.

C. The "sweet spot" for industry 4.0 is a deployment strategy for delivering the required capacity and coverage forindustrials.

D. The "sweet spot" for industry 4.0 is the intersection of operational, information and communications technologies.

ANSWER: D

Explanation:

The "sweet spot" for industry 4.0 is the intersection of operational, information and communications technologies. Industry 4.0 derives its value from bringing together operational technology, which controls and monitors physical industrial processes; information technology, which manages data, applications, analytics, and enterprise workflows; and communications technology, which provides the reliable, secure connectivity needed to exchange information among machines, sensors, control systems, and cloud or edge platforms. This convergence enables capabilities such as real-time visibility, flexible automation, predictive maintenance, digital twins, and coordinated production processes. In a 5G-enabled industrial environment, communications is not an isolated transport function: it is an enabler that connects OT assets with IT systems while supporting the performance, availability, and security requirements of industrial operations. Nokia describes private wireless as a foundation for digitalizing industrial operations and connecting operational assets, while its Industry 4.0 material emphasizes the convergence of OT and IT for industrial transformation. The combined OT, IT, and communications domain is therefore the practical area in which Industry 4.0 use cases can be implemented at scale and generate operational value. See Nokia industrial digitalization and Nokia private wireless.

QUESTION NO: 3

Which of the following are benefits of cloud-native network functions? (Choose three.)

A. Horizontal scaling of application instances.

B. Automated healing of failed application instances.

C. Portable deployment through containerized software components.

D. Permanent removal of the need for service assurance.

ANSWER: A B C

Explanation:

Cloud-native network functions are designed to use cloud infrastructure and automation efficiently. Containerized deployment can improve portability and lifecycle consistency, while horizontal scaling allows additional instances to be added when workload demand increases. Automated healing can replace or restart failed instances, improving service resiliency.

Cloud-native design does not eliminate the need for capacity planning, operational policies, or security controls. It also does not require every function to run in one centralized data center; distributed cloud deployment can be selected according to service requirements. ETSI describes cloud-native principles for NFV in ETSI NFV.

QUESTION NO: 4

In terms of scalability, flexibility, and capacity, which of the following would overcome 4G limitations?

A. Service based architecture, stateless networkfunctions, Cloud-ready network functions and modular network functions.

B. Client/Server architecture, stateless network functions, Cloud-ready network functions and modular network functions.

C. Client/Server architecture, Cloud-ready network functions,and modular network functions.

ANSWER: A

Explanation:

Service based architecture, stateless network functions, Cloud-ready network functions and modular network functions is correct because these are fundamental design principles of the 5G Core. A service-based architecture exposes network-function services through standardized interfaces, allowing functions to interact more flexibly and enabling capabilities to be introduced or consumed without tightly coupled point-to-point integrations. This supports faster evolution of the core and more adaptable service delivery.

Stateless network-function design allows processing instances to be scaled horizontally and recovered more easily, since persistent subscriber and session context can be managed separately. Cloud-ready implementation enables network functions to use cloud infrastructure, automation, and elastic resource allocation so capacity can grow or shrink in response to demand. Modular functions further permit independent deployment, upgrading, and scaling of individual capabilities rather than requiring changes to a monolithic core. Together, these characteristics provide the scalability, operational flexibility, and capacity growth needed to address the more centralized and tightly coupled limitations associated with earlier mobile-core designs. The 5G System architecture and service-based interfaces are specified in 3GPP TS 23.501; the related service-based architecture procedures are described in 3GPP TS 23.502.

QUESTION NO: 5

Which Network Function is responsible for providing policy rules to control network behavior in the 5G Core?

A. Policy Control Function (PCF)

B. Unified Data Management (UDM)

C. Network Slice Selection Function (NSSF)

D. User Plane Function (UPF)

ANSWER: A

Explanation:

The Policy Control Function (PCF) is correct because it provides policy rules to other 5G Core Network Functions. These policies can influence Quality of Service, charging, access and session behavior according to subscriber, application and operator requirements.

For example, the SMF can obtain session-related policy information from the PCF and use it when controlling a PDU session and its QoS flows. The PCF does not forward user-plane packets or perform primary UE authentication. The 5G policy framework is described in 3GPP TS 23.503.

QUESTION NO: 6

What are the five key features of 5G Core?

A. Dynamic Control plane, Adaptive Architecture, Converged-Access-Network, Stateless and Network Self- healing

B. Dynamic Control plane, Service Based Architecture, Multi-Access-Network, State-efficiency and Network Slicing

C. Dynamic Control plane, Adaptive Architecture, Multi-Access-Network, Stateless and Network Slicing

D. Control and User Planes Separation, Service Based Architecture, Multi-Access-Network, State-efficiency and Network Slicing

ANSWER: D

Explanation:

Control and User Planes Separation, Service Based Architecture, Multi-Access-Network, State-efficiency and Network Slicing correctly identifies the foundational architectural characteristics of the 5G Core. Separating the control plane from the user plane allows signaling functions and high-throughput packet forwarding functions to be independently placed, scaled, and evolved. The service-based architecture defines core network functions as service producers and consumers, using standardized interfaces that support cloud-native deployment and flexible function interaction. Multi-access support enables a common core to serve devices over 3GPP access, such as 5G radio, and non-3GPP access, such as trusted or untrusted Wi-Fi. State efficiency reflects the 5G Core design principle of minimizing persistent state in network functions where practical, helping support resilience, elastic scaling, and efficient cloud operations. Network slicing enables logically separated, purpose-specific networks with differentiated capabilities and service characteristics on shared infrastructure. These features together make the 5G Core more flexible, programmable, and adaptable to diverse consumer, enterprise, and industrial requirements. The 3GPP system architecture specifies the service-based architecture, control/user-plane separation, multi-access integration, and network slicing framework; Nokia also describes these cloud-native 5G Core capabilities in its portfolio material. See 3GPP TS 23.501 and Nokia 5G Core.

QUESTION NO: 7

Which of the following technologies drive 5G increased throughput capacity? (Choose three.)

A. MU-MIMO and beamforming

B. Higher spectral efficiency

C. Network Slicing

D. Multi-connectivity per User Equipment

ANSWER: A B D

Explanation:

“MU-MIMO and beamforming,” “Higher spectral efficiency,” and “Multi-connectivity per User Equipment” directly contribute to increased 5G throughput capacity. MU-MIMO enables the radio system to serve multiple users simultaneously using spatially separated streams, while beamforming concentrates transmitted energy toward intended users. Together, these techniques improve spatial reuse and make more efficient use of available radio resources. Higher spectral efficiency increases the number of useful bits that can be delivered per hertz of spectrum, supported in 5G by features such as advanced antenna techniques, adaptable modulation and coding, and improved radio scheduling. Multi-connectivity allows a user equipment device to use resources from more than one radio link or cell, which can aggregate available capacity and improve the user’s achievable data rate. These capabilities align with 5G performance objectives for substantially higher user-experienced and peak data rates, as described by the ITU’s IMT-2020 framework and 3GPP’s 5G service-requirements work. See the ITU IMT-2020 vision and 3GPP TS 22.261 archive.