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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VI - THEORY EXAMINATION (2025 - 2026)

Subject: 5G Technology

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

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1. Attempt all parts:-

- (1.1) Which of the following protocols is responsible for security in 5G networks? (CO1, K1) 1
- (a) PDCCP Protocol
 - (b) RRC Protocol
 - (c) NAS Protocol
 - (d) MAC Protocol
- (1.2) 5G will offer latency of one millisecond or lower. What does latency refer to? 1
- (CO1, K1)
- (a) The delay between an input and a desired outcome
 - (b) The time it takes to reboot a connection
 - (c) The speed of detecting a disruption to the network
 - (d) The length of time devices will automatically connect to the network
- (1.3) What is propagation modelling in 5G networks? (CO2, K1) 1
- (a) A technique for predicting how radio signals will behave when transmitted in the 5G frequency band
 - (b) A technique for encrypting data transmitted over 5G networks
 - (c) A technique for optimizing network performance in 5G networks
 - (d) A technique for identifying rogue devices on 5G networks
- (1.4) Why is channel modelling necessary? (CO2, K2) 1
- (a) To predict the behavior of the communication channel
 - (b) To optimize the performance of the communication system
 - (c) To reduce the cost of communication system

- (d) All of the above
- (1.5) What is the main advantage of using Massive MIMO in 5G RAN? (CO3, K2) 1
- (a) Increased coverage area
 - (b) Reduced latency
 - (c) Improved spectral efficiency
 - (d) Enhanced security
- (1.6) Technique of drawing a single ray between the transmitter and receiver is called _____ (CO3, K1) 1
- (a) Secondary ray tracing
 - (b) Primary ray tracing
 - (c) Line of sight
 - (d) Straight line tracing
- (1.7) What are the factors considered in the handover decision in 5G ? (CO4, K2) 1
- (a) Signal strength, signal quality, and mobility speed
 - (b) Network capacity, latency, and bandwidth
 - (c) Frequency band, power level, and modulation scheme
 - (d) None of the above
- (1.8) Which of the following is used to represent an IPv6 multicast address? (CO4, K1) 1
- (a) ff00::
 - (b) fe80::
 - (c) fc00::
 - (d) fd00::
- (1.9) Which of the following is true about NFV for 5G networks? (CO5, K1) 1
- (a) It enables faster deployment of new network services
 - (b) It increases the complexity of the network
 - (c) It requires specialized hardware for implementation
 - (d) It is only useful for small-scale networks
- (1.10) The key technology for implementing network slicing is ----- (CO5, K2) 1
- (a) Software-Defined Networking (SDN).
 - (b) Network Function Virtualization (NFV).
 - (c) Cloud Computing.
 - (d) All of the above.

2. Attempt all parts:-

- (2.1) What is radio bearer in 5G? (CO1, K2) 2
- (2.2) What are the advantages of using mm wave technology in wireless communication systems? (CO2, K2) 2
- (2.3) What is the role of antenna array in beamforming? (CO3, K1) 2
- (2.4) What are the QoS characteristics in 5G? (CO4, K2) 2
- (2.5) Write the benefits of NFV architecture. (CO5, K1) 2

SECTION-B

30

Answer any one of the following:-

- (3.1) What is the function of MAC layer in 5G? (CO1, K2) 6
- (3.2) What is the difference between 5G NR and 4G (LTE)? (CO1, K1) 6

Answer any one of the following:-

- (3.3) How is path loss calculated in 5G propagation modelling? Explain. (CO2, K3) 6
- (3.4) Explain the outdoor to indoor (O2I) penetration loss model. (CO2,K2) 6

Answer any one of the following:-

- (3.5) How does massive MIMO works? Also write the advantages of massive MIMO. (CO3, K1) 6
- (3.6) How does beamforming help in reducing interference and increasing system capacity? (CO3, K2) 6

Answer any one of the following:-

- (3.7) How does 5G enable network slicing to provide different QoS levels for different services? (CO4,K3) 6
- (3.8) How does interference affect the performance of 5G networks? Explain. (CO4, K2) 6

Answer any one of the following:-

- (3.9) How does NFV help to reduce network deployment and maintenance costs in 5G networks? (CO5, K2) 6
- (3.10) How can network slicing be used to support network automation and orchestration in 5G networks? (CO5, K3) 6

SECTION-C 50

4. Answer any one of the following:-

- (4.1) How does 5G RAN affect network performance? Explain.(CO1, K2) 10
- (4.2) How does the 5G access stratum (AS) protocol handle mobility management ? Also discuss the role of SDAP and RRC protocol in 5G NR. (CO1, K3) 10

5. Answer any one of the following:-

- (5.1) Describe a typical 5G operating scenario, including the role of small cells, dense deployment, and edge computing. (CO2, K3) 10
- (5.2) What are the challenges of implementing 5G? Also explain, How does 5G enable better security compared to 4G? (CO2, K2) 10

6. Answer any one of the following:-

- (6.1) Explain the impact of imperfect CSI on Massive MIMO systems. (CO3, K1) 10
- (6.2) What are the key challenges in Channel Estimation in Massive MIMO? Explain. (CO3, K2) 10

7. Answer any one of the following:-

- (7.1) How does interference affect the performance of 5G networks? Also explain mobility management? (CO4, K3) 10
- (7.2) Explain the basic QoS structure and its classes in 5G networks.(CO4, K2) 10

8. Answer any one of the following:-

- (8.1) What are the key components of an NFV architecture, and how do they work together to enable network function virtualization? (CO5, K1) 10

- (8.2) How can network slicing be used to support different types of services, such as low-latency applications, mission-critical services, and IoT applications? (CO5, K2) 10

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