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Printed Page:-4 **Subject Code:- AEC0603**

Roll. No:

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 20

1. Attempt all parts:-

(1.1) In a 5G network, cell tower is known as_____. (CO1, K1) 1

(a) dNodeB
(b) eNodeB
(c) gNodeB
(d) hNodeB

(1.2) 5G networks operate on up to three frequency bands. these are .....(CO1,K2) 1

(a) Low
(b) Medium
(c) High
(d) All of the Above

(1.3) 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

(1.4) Which of the following factors can affect the propagation of 5G signals? (CO2,K2) 1

(a) Atmospheric conditions
(b) The height of the transmitter
(c) The thickness of walls
(d) All of the above

(1.5) MIMO means both transmitter and receiver have ---------- antennas. (CO3,K2) 1

(a) Multiple
(b) Single
(c) Both a and b
(d) None

(1.6) The propagation model that estimates radio coverage of a transmitter is called _____ (CO3,K2) 1

(a) Large scale propagation model
(b) Small scale propagation model
(c) Fading model
(d) Okumura model

(1.7) Which of the following are some common functions used to provide QoS in the data plane? (CO4,K2) 1

(a) Flow bit rates, aggregate bit rates, notification control and default values
(b) Resource type, priority level, packet error rate and maximum data burst volume
(c) Traffic classification, packet marking, traffic shaping and congestion avoidance
(d) Session management function, user plane function, policy control function and network repository function

(1.8) The difference between hard handover and soft handover in 5G is---------- (CO4, K2) 1

(a) Hard handover is faster than soft handover.
(b) Soft handover is faster than hard handover.
(c) Hard handover involves a complete break in communication, while soft handover does not.
(d) Soft handover involves a complete break in communication, while hard handover does not.

(1.9) The benefits of network slicing is ----------. (CO5,K2) 1

(a) Increased network efficiency and flexibility.
(b) Better utilization of network resources.
(c) Improved service delivery.
(d) All of the above.

(1.10) The primary challenge in implementing network slicing in 5G networks is ----------.(CO5,K2) 1

(a) Ensuring interoperability between different vendors' equipment.
(b) Addressing security concerns related to the sharing of resources.
(c) Managing the complexity of creating and maintaining multiple slices.
(d) Ensuring the availability of high-bandwidth connectivity to support multiple slices.

2. Attempt all parts:-

(2.1) What are the two types of protocol stack? (CO1,K2) 2

(2.2) How does 5G handle signal interference? (CO2, K3) 2

(2.3) How do propagation channel models account for the effects of fading? (CO3,K3) 2

(2.4) Explain the mobility management in 5G. (CO4, K2) 2

(2.5)	What is the role of management and orchestration in network slicing? (CO5,K3)	2

SECTION-B 30

Answer any one of the following:-

(3.1)	What is the evolution of wireless trend in the different generations up to 5G ? Explain each generation with minimum two specifications.(CO1,K2)	6
(3.2)	What are the functions of MAC layer in LTE? (CO1, K2)	6

Answer any one of the following:-

(3.3)	What is the impact of fading on channel modelling, and how is it typically accounted for? (CO2, K3)	6
(3.4)	What is the key difference and main advantages of 5G over 4G? (CO2,K3)	6

Answer any one of the following:-

(3.5)	How do designers validate the accuracy of propagation channel models for Massive MIMO systems? Explain. (CO3,K3)	6
(3.6)	How does beamforming improve the performance of massive MIMO? Explain. (CO3,K3)	6

Answer any one of the following:-

(3.7)	Define mobility management. Also Explain the various features of mobility management in 5G. (CO4, K2)	6
(3.8)	Explain the latency and throughput in 5G QoS? (CO4,K3)	6

Answer any one of the following:-

(3.9)	What are the benefits of network slicing for network operators and end-users? (CO5, K2)	6
(3.10)	How can network slicing be used to improve network efficiency.Explain (CO5,K3)	6

SECTION-C 50

4. Answer any one of the following:-

(4.1)	Explain 5G NR network architecture, its elements and its network interfaces? (CO1, K3)	10
(4.2)	What is SMF? Explain the essential function of SMF in 5G NR. (CO1, K2)	10

5. Answer any one of the following:-

(5.1)	How do propagation scenarios vary between indoor and outdoor environments? Explain in detail. (CO2, K3)	10
(5.2)	How does 5G enable greater device density and higher reliability compared to 4G? Explain. (CO2,K4)	10

6. Answer any one of the following:-

(6.1)	What are the key challenges in Channel Estimation in Massive MIMO? Explain briefly.(CO3,K3)	10
(6.2)	Analyze the trade-offs between various design parameters, including the number of antennas, the number of users, and the type of beamforming, to maximize network capacity and throughput. (CO3,K4)	10

7. Answer any one of the following:-

(7.1)	Explain the key parameters used for handover management in 5G. (CO4,K3)	10

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(7.2)	How is the QoS flow identifier used in 5G? Explain. (CO4,K3)	10

8. Answer any one of the following:-

(8.1)	What are the key technical components of a network slicing architecture? Explain. (CO5,K3)	10
(8.2)	What role do virtualization technologies, such as software-defined networking (SDN) and network functions virtualization (NFV), play in enabling network slicing in 5G networks? (CO5, K4)	10