Printed Page:- 04 **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 (2023 - 2024)

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-a. 5G networks operate on up to three frequency bands. these are .....(CO1) 1

(a) Low

(b) Medium

(c) High

(d) All of the Above

1-b. 5G will offer latency of one millisecond or lower. What does latency refer to? (CO1) 1

(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-c. What is channel modelling? (CO2) 1

(a) The process of designing a communication channel

(b) The process of simulating a communication channel

(c) The process of optimizing a communication channel

(d) The process of testing a communication channel

1-d. What is a propagation scenario in 5G modelling? (CO2) 1

(a) The path that the 5G signal takes from the transmitter to the receiver

(b) The type of device used to transmit the 5G signal

(c) The encryption algorithm used to secure the 5G signal

(d) The frequency range used by the 5G signal

1-e. MIMO means both transmitter and receiver have ---------- antennas. (CO3) 1

(a) Multiple

(b) Single

(c) Both a and b

(d) None

1-f. Which of the following is a universally adopted shape of cell? (CO3) 1

(a) Square Option

(b) Circle Option

(c) Triangle

(d) Hexagonal

1-g. What is the definition of QoS?(CO4) 1

(a) The process by which network resources are controlled to implement a given policy for a given user

(b) A set of rules specifying the user plane services and functions available to a particular user, supplied by the network

(c) A value assigned to specific packets transmitted to/from a user that determines the relative importance of transmitting those packets during the upcoming opportunity to use the medium

(d) The measurable end-to-end performance properties of a network service, which can be guaranteed in advance by a service-level agreement (SLA) between a user and a service provider

1-h. What is the purpose of handover in 5G? (CO4) 1

(a) To ensure that the user equipment remains connected to the same base station.

(b) To ensure that the user equipment remains connected to the same user equipment.

(c) To ensure that the user equipment remains connected to the best available base station.

(d) To ensure that the user equipment remains connected to the best available user equipment.

1-i. The benefits of network slicing is ----------. (CO5) 1

(a) Increased network efficiency and flexibility.

(b) Better utilization of network resources.

(c) Improved service delivery.

(d) All of the above.

1-j. What does SDN stand for? (CO5) 1

(a) System Deployment Network

(b) Security Domain Network

(c) Software-Defined Network

(d) Service Delivery Network

2. Attempt all parts:-

2.a.	What is 5G NR (New Radio)? (CO1)	2
2.b.	What are the key features of 5G technology? (CO2)	2
2.c.	What are some common propagation channel models used for Massive MIMO systems?(CO3)	2
2.d.	Explain the importance of handover in 5G? (CO4)	2
2.e.	What are the benefits of SDN? (CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	What are 5G major advantages? (CO1)	6
3-b.	Calculate the diameter of a dish antenna having a Maximum gain of 40 dB and operating at a frequency of 6gHz. (CO1)	6
3-c.	What are the key components of a typical mm wave system? (CO2)	6
3-d.	What is propagation modeling in 5G? (CO2)	6
3.e.	What is beamforming in massive MIMO? Explain. (CO3)	6
3.f.	How does interference affect the performance of 5G networks? (CO4)	6
3.g.	What is the role of virtualization in 5G technology?(CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain 5G NR network architecture, its elements and its network interfaces?(CO1)	10
4-b.	What is SMF? What is the essential function of SMF in 5G NR? (CO1)	10

5. Answer any one of the following:-

5-a.	How does the 5G operating scenario differ from that of previous generations of mobile networks in terms of coverage, capacity, and energy efficiency? (CO2)	10
5-b.	Explain the role of beamforming and key components in mm wave systems. (CO2)	10

6. Answer any one of the following:-

6-a.	What are the key challenges in Channel Estimation in Massive MIMO? Explain briefly.(CO3)	10
6-b.	How does beamforming enhance the performance of wireless communication systems? Explain. (CO3)	10

7. Answer any one of the following:-

7-a.	What is network slicing and how does it help to improve QoS in 5G networks? (CO4)	10
7-b.	Explain Routing Algorithms in detail. (CO4)	10

8. Answer any one of the following:-

8-a.	What role do software-defined networks (SDNs) and network function virtualization (NFV) play in 5G operating scenarios, and how do they support scalability and flexibility? (CO5)	10
8-b.	Explain the challenges associated with implementing network slicing in a large-scale network? How can network slicing be used to improve network efficiency and reduce operational costs? (CO5)	10