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

(a) dNodeB

(b) eNodeB

(c) gNodeB

(d) hNodeB

1-b. 5G was developed by? (CO1) 1

(a) 3GPP

(b) Google

(c) IBM

(d) Reliance

1-c. Which of the following parameters are necessary for channel modelling? (CO2) 1

(a) Channel bandwidth

(b) Signal power

(c) Channel impulse response

(d) All of the above

1-d. What is the significance of the time delay spread of the channel? (CO2) 1

(a) It determines the frequency selectivity of the channel

(b) It determines the coherence bandwidth of the channel

(c) It determines the multipath effect in the channel

(d) It determines the Doppler spread of the channel

1-e. Technique of drawing a single ray between the transmitter and receiver is called _____ (CO3) 1

(a) Secondary ray tracing

(b) Primary ray tracing

(c) Line of sight

(d) Straight line tracing

1-f. Path loss in free space model is defined as difference of _____ (CO3) 1

(a) Effective transmitted power and gain

(b) Effective received power and distance between T-R

(c) Gain and received power

(d) Effective transmitter power and receiver power

1-g. What is mobility management in 5G? (CO4) 1

(a) A mechanism that manages the interference between base stations.

(b) A mechanism that manages the interference between user equipments.

(c) A mechanism that manages the handover of user equipments between base stations.

(d) A mechanism that manages the synchronization between base stations.

1-h. Which routing protocol supports multiple paths to a destination? (CO4) 1

(a) BGP

(b) PFCP

(c) ICMP

(d) RIP

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. Which of the following is not a benefit of SDN? (CO5) 1

(a) Simplifies network management

(b) Increases network latency

(c) Enhances network agility and scalability

(d) Improves network security

2. Attempt all parts:-

2.a. What is latency in 5G? (CO1) 2

2.b. What are the main requirements for channel modelling in wireless communication systems? (CO2) 2

2.c. Why are propagation channel models important for Massive MIMO systems? (CO3) 2

2.d. What is interference in 5G? (CO4) 2

2.e. What is the role of management and orchestration in network slicing? (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. What is the difference between 5G NR and 4G (LTE)? (CO1) 6

3-b. What are physical channels in 5G NR? (CO1) 6

3-c. What is multi-path propagation and how does it affect 5G? (CO2) 6

3-d. What are the key parameters of a mmWave channel model?(CO2) 6

3.e. What is Massive MIMO and how does it differ from traditional MIMO? (CO3) 6

3.f. How does interference affect the performance of 5G networks? (CO4) 6

3.g. How can network slicing be used to improve network efficiency and reduce operational costs? 6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a. What is the physical layer of 5G protocol? Explain. (CO1) 10

4-b. How does 5G RAN affect network performance? Explain.(CO1) 10

5. Answer any <u>one</u> of the following:-

5-a. What is mm wave technology and how does it work? (CO2) 10

5-b. What is the role of the environment in 5G propagation modeling? How does terrain affect 5G propagation? (CO2) 10

6. Answer any <u>one</u> of the following:-

6-a.	What are the key challenges in Channel Estimation in Massive MIMO? Explain briefly.(CO3)	10
6-b.	What is beamforming in massive MIMO? Explain with suitable diagram. (CO3)	10

7. Answer any <u>one</u> of the following:-

7-a.	How is interference managed during handover in 5G networks? Explain. (CO4)	10
7-b.	Calculate the free space loss(assuming free space conditions) in a satellite communication where the satellite is at a height of 36,000 km above the earth. Given Gt=15dB, ,Gr= 45dB , f= 4GHz,What is the power received , if the power radiated is 200watts. (CO4)	10

8. Answer any <u>one</u> of the following:-

8-a.	Explain the roles of SDN and NFV in network slicing? (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