Printed Page:- **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 (20.....- 20.....)

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, K1) 1

(a) dNodeB

(b) eNodeB

(c) gNodeB

(d) hNodeB

1-b. The spectrum efficiency measures . ..... (CO1, K1) 1

(a) How many users can connect to one network

(b) How many connections can run securely at once

(c) How many bits of data can be transmitted to a certain number of users per second

(d) All of the above

1-c. What is the significance of the time delay spread of the channel ? (CO2, K2) 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-d. What is the maximum number of devices that can be connected per square kilometer in 5G networks ? (CO2, K1) 1

(a) 10000

(b) 100000

(c) 1 million

(d) 10 million

1-e. Small scale propagation model is also known as _____ (CO3, K1) 1

(a) Micro scale propagation model

(b) Okumura model

(c) Hata model

(d) Fading model

1-f. How does beamforming improve network service ? (CO3, K2) 1

(a) by sharing service signals between devices on a network

(b) by connecting devices directly to power sources

(c) by using multiple antennas to increase range and bandwidth

(d) by using device locations to better target service signals

1-g. Which technology is used for mobility management in 5G ? (CO4, K1) 1

(a) LTE

(b) Wi-Fi

(c) NR

(d) VOLTE

1-h. 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-i. What is the purpose of network slicing ? (CO5, K2) 1

(a) To provide customized network services to different types of applications and users.

(b) To reduce network latency.

(c) To increase network throughput.

(d) None of the above.

1-j. The role of the transport network in a network slice is ----------.(CO5, K3) 1

(a) To provide connectivity between the core network and the application servers.

(b) To provide connectivity between different network slices and their associated services.

(c) To provide connectivity between the core network and the RAN.

(d) All of the above.

2. Attempt all parts:-

2.a. What are the components in the 5G NR network architecture ? (CO1, K1) 2

2.b. What is a channel model for mmWave ? (CO2, K2) 2

2.c. What are the advantages of beamforming over traditional omnidirectional antennas ? (CO3, K1) 2

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2.d.	What is the role of handoff triggering in 5G handoff management ? (CO4, K3)	2
2.e.	What is the difference between a dedicated network slice and a shared network slice ? (CO5, K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	What are physical channels in 5G NR? (CO1, K1)	6
3-b.	What are the functions of MAC layer in LTE? (CO1, K2)	6
3-c.	What is multi-path propagation, and how does it affect 5G? (CO2, K2)	6
3-d.	How is path loss calculated in 5g propagation modelling? Explain. (CO2, K2)	6
3.e.	Describe the channel estimation in massive MIMO. (CO3, K3)	6
3.f.	What are the challenges associated with QoS improvement in 5G networks? (CO4, K3)	6
3.g.	How can network slicing be used to improve network security and resilience ? (CO5, K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	What are the functions of RRC layer in 5G NR? Explain RRC states with state diagram. (CO1, K4)	10
4-b.	What is SMF? Explain the essential function of SMF in 5G NR. (CO1, K2)	10

5. Answer any one of the following:-

5-a.	How do propagation scenarios vary between indoor and outdoor environments? Explain in detail. (CO2, K3)	10
5-b.	Describe a typical 5G operating scenario, including the role of small cells, dense deployment, and edge computing. (CO2, K3)	10

6. Answer any one of the following:-

6-a.	How does the use of cooperative massive MIMO systems improve the coverage and capacity of wireless communication systems? Explain. (CO3, K3)	10
6-b.	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-a.	How does 5G handover management ensure seamless connectivity and minimize service interruptions for users?. (CO4, K3)	10
7-b.	Discuss the different types of routing protocols and IPv6 addressing. Explain their significance and applications. (CO4 ,K3)	10

8. Answer any one of the following:-

8-a.	Explain the concept of network slicing in 5G. Discuss its benefits and potential applications, and compare it to previous network technologies (CO5, K2)	10
8-b.	Describe the concept of Network Functions Virtualization (NFV) and its	10

fundamental architecture. How does NFV enable network functions to be virtualized and what are the key components involved in its implementation ? (CO5, K3)

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