



SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

QUESTION BANK



VII SEMESTER

PEC605 5G AND BEYOND

Regulation – 2023

Academic Year 2026-2027 (Odd)

Prepared by

Dr. KOMALA JAMES, Professor and Head – ECE



SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203.



DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

QUESTION BANK

SUBJECT : PEC605 5G AND BEYOND

SEM / YEAR: VII/ IV-year B.E.

UNIT I				
EVOLUTION OF WIRELESS NETWORKS				
Network evolution: 2G, 3G, 4G – Evolution of radio access networks – need for 5G- 4G versus 5G – next generation core (NG- Core) – Visualized evolved packet core (vEPC).				
PART – A				
Q.No	Questions	CO	BT Level	Competence
1.	Define 2G wireless communication.	CO1	BTL 1	Remembering
2.	What is meant by 3G technology?	CO1	BTL 1	Remembering
3.	State the main feature of 4G networks.	CO1	BTL 1	Remembering
4.	Expand GSM and LTE.	CO1	BTL 1	Remembering
5.	What is a Radio Access Network (RAN)?	CO1	BTL 1	Remembering
6.	List any two services provided by 2G networks.	CO1	BTL 1	Remembering
7.	Name the multiple access technique used in 3G systems.	CO1	BTL 1	Remembering
8.	What is meant by packet switching?	CO1	BTL 1	Remembering
9.	Define 5G wireless network.	CO1	BTL 1	Remembering
10.	State any two requirements that led to the development of 5G.	CO1	BTL 1	Remembering
11.	What is NG-Core in 5G architecture?	CO1	BTL 1	Remembering
12.	Define Virtualized Evolved Packet Core (vEPC).	CO1	BTL 1	Remembering
13.	Differentiate between 2G and 3G networks.	CO1	BTL 2	Understanding
14.	Compare 3G and 4G technologies based on data rate.	CO1	BTL 2	Understanding
15.	Distinguish between circuit switching and packet switching.	CO1	BTL 2	Understanding
16.	Summarize the evolution from 2G to 4G networks.	CO1	BTL 2	Understanding
17.	Compare the architecture of traditional RAN and evolved RAN.	CO1	BTL 2	Understanding
18.	Differentiate between LTE and LTE-Advanced.	CO1	BTL 2	Understanding
19.	Compare 4G and 5G in terms of latency.	CO1	BTL 2	Understanding
20.	Differentiate between 4G core network and NG-Core.	CO1	BTL 2	Understanding
21.	Classify the key components of a 5G network architecture.	CO1	BTL 2	Understanding
22.	Compare the spectrum utilization of 4G and 5G networks.	CO1	BTL 2	Understanding
23.	Distinguish between EPC and vEPC.	CO1	BTL 2	Understanding
24.	Summarize the advantages of network virtualization in vEPC.	CO1	BTL 2	Understanding
PART- B				

1.	Apply the concepts of wireless network evolution to compare the architecture, services, and limitations of 2G, 3G, and 4G networks with suitable diagrams.	(16)	CO1	BTL 3	Applying
2.	Illustrate the evolution of Radio Access Networks (RAN) from 2G to 4G and explain how each generation improved network performance and user experience.	(16)	CO1	BTL 3	Applying
3.	Apply the principles of packet-switched communication to explain the operation of the 4G LTE architecture and its key components.	(16)	CO1	BTL 3	Applying
4.	Demonstrate the necessity of 5G by applying current mobile communication requirements such as IoT, autonomous vehicles, and smart cities.	(16)	CO1	BTL 3	Applying
5.	Illustrate the architecture of the Next Generation Core (NG-Core) and explain the functions of its major network elements.	(16)	CO1	BTL 3	Applying
6.	Apply virtualization concepts to explain the architecture and working of the Virtualized Evolved Packet Core (vEPC) in modern wireless networks.	(16)	CO1	BTL 3	Applying
7.	Analyze the technological advancements that led to the transition from 2G to 3G and 3G to 4G, highlighting the challenges overcome in each generation.	(16)	CO1	BTL 4	Analyzing
8.	Analyze the evolution of radio access technologies from GSM to LTE and discuss their impact on spectral efficiency and network capacity.	(16)	CO1	BTL 4	Analyzing
9.	Compare and analyze the key differences between 4G and 5G networks in terms of architecture, latency, data rate, spectrum usage, and applications.	(16)	CO1	BTL 4	Analyzing
10.	Analyze the role of NG-Core in supporting network slicing, service-based architecture, and ultra-low latency communication in 5G.	(16)	CO1	BTL 4	Analyzing
11.	Analyze the architecture of vEPC and evaluate how virtualization improves scalability, flexibility, and resource utilization compared to traditional EPC.	(16)	CO1	BTL 4	Analyzing
12.	Examine and analyze the limitations of 4G networks that necessitated the development of 5G technology.	(16)	CO1	BTL 4	Analyzing
13.	Evaluate the performance improvements achieved in 5G over 4G with respect to throughput, latency, reliability, and connectivity.	(16)	CO1	BTL 5	Evaluating
14.	Assess the effectiveness of Radio Access Network evolution in meeting the growing demands of mobile broadband and IoT applications.	(16)	CO1	BTL 5	Evaluating

15.	Evaluate the significance of NG-Core architecture in enabling future wireless communication services and emerging applications.	(16)	CO1	BTL 5	Evaluating
16.	Critically evaluate the advantages and challenges of implementing Virtualized EPC (vEPC) in commercial mobile networks.	(16)	CO1	BTL 5	Evaluating
17.	Evaluate and justify whether 5G can effectively address the requirements of Industry 4.0, smart healthcare, autonomous transportation, and massive IoT deployments.	(16)	CO1	BTL 5	Evaluating

UNIT II				
LINEAR PREDICTION AND FILTERING				
Fundamentals of 5G technologies - Overview of 5G core network architecture – 5G new radio and cloud technologies - Radio Access Technologies (RATs) – EPC for 5G.				
PART – A				
Q. No	Questions	CO	BT Level	Competence
1.	Define 5G technology.	CO2	BTL1	Remembering
2.	What is meant by 5G Core Network (5GC)?	CO2	BTL1	Remembering
3.	Expand the term NR in 5G NR.	CO2	BTL1	Remembering
4.	What is a Radio Access Technology (RAT)?	CO2	BTL1	Remembering
5.	State any two features of 5G networks.	CO2	BTL1	Remembering
6.	What is Enhanced Mobile Broadband (eMBB)?	CO2	BTL1	Remembering
7.	What is Ultra-Reliable Low-Latency Communication (URLLC)?	CO2	BTL1	Remembering
8.	What is Massive Machine Type Communication (mMTC)?	CO2	BTL1	Remembering
9.	What is meant by network slicing?	CO2	BTL1	Remembering
10.	Expand EPC and 5GC.	CO2	BTL1	Remembering
11.	List any two components of the 5G Core Network.	CO2	BTL1	Remembering
12.	What is cloud computing in 5G networks?	CO2	BTL1	Remembering
13.	Differentiate between 4G LTE and 5G NR.	CO2	BTL2	Understanding
14.	Classify the major service categories supported by 5G.	CO2	BTL2	Understanding
15.	Summarize the role of the Access and Mobility Management Function (AMF).	CO2	BTL2	Understanding
16.	Distinguish between EPC and 5G Core Network.	CO2	BTL2	Understanding
17.	Interpret the significance of low latency in 5G communication.	CO2	BTL2	Understanding
18.	Compare licensed and unlicensed spectrum usage in 5G.	CO2	BTL2	Understanding
19.	Outline the purpose of cloud-native architecture in 5G.	CO2	BTL2	Understanding
20.	Differentiate between standalone (SA) and non-standalone (NSA) 5G deployment.	CO2	BTL2	Understanding
21.	Identify the functions of the User Plane Function (UPF) in 5G Core.	CO2	BTL2	Understanding
22.	Compare traditional network architecture with cloud-based 5G architecture.	CO2	BTL2	Understanding

23.	Relate 5G NR to improved spectral efficiency.		CO2	BTL2	Understanding
24.	Infer the importance of Radio Access Technologies in enabling seamless connectivity.		CO2	BTL2	Understanding
PART- B					
1.	Explain the fundamentals of 5G technology and its key performance requirements.	(16)	CO2	BTL3	Applying
2.	(a) Draw and explain the architecture of the 5G Core Network. (b) Explain the functions of major network elements in 5GC.	(8) (8)	CO2	BTL3	Applying
3.	(a) Explain cloud computing concepts used in 5G networks. (b) Discuss the benefits of cloud-native architecture in 5G deployment.	(8) (8)	CO2	BTL3	Applying
4.	Apply the concept of 5G New Radio (NR) to modern wireless communication systems.	(16)	CO2	BTL3	Applying
5.	Explain the significance of Radio Access Technologies (RATs) in 5G networks.	(16)	CO2	BTL3	Applying
6.	(a) Explain the architecture of Evolved Packet Core (EPC). (b) Discuss the enhancements required in EPC to support 5G services.	(8) (8)	CO2	BTL3	Applying
7.	Analyze the evolution from EPC to 5G Core Network.	(16)	CO2	BTL4	Analyzing
8.	Analyze the architecture of 5G NR and its impact on network performance. Analyze the advantages of 5G NR over LTE.	(16)	CO2	BTL4	Analyzing
9.	(a) Explain Network Function Virtualization (NFV) and Software Defined Networking (SDN). (b) Analyze their contribution to 5G deployment and management.	(8) (8)	CO2	BTL4	Analyzing
10.	Compare and analyze various Radio Access Technologies used in wireless networks.	(16)	CO2	BTL4	Analyzing
11.	(a) Explain the concept of Service-Based Architecture (SBA). (b) Analyze the interaction among 5GC network functions.	(8) (8)	CO2	BTL4	Analyzing
12.	(a) Discuss containerization and microservices in 5G. (b) Analyze their advantages over traditional network architectures.	(8) (8)	CO2	BTL4	Analyzing
13.	Evaluate the effectiveness of 5G Core Network architecture in supporting next-generation services.	(16)	CO2	BTL5	Evaluating
14.	Evaluate the performance improvements offered by 5G New Radio.	(16)	CO2	BTL5	Evaluating
15.	(a) Explain cloud-based network deployment models. (b) Evaluate the benefits and challenges of cloud technologies in 5G.	(8) (8)	CO2	BTL5	Evaluating
16.	Evaluate the significance of Radio Access Technologies in heterogeneous 5G environments.	(16)	CO2	BTL5	Evaluating

17.	(a) Explain the architecture and functions of EPC. (b) Evaluate the advantages of migrating from EPC to 5G.	(8) (8)	CO2	BTL5	Evaluating
-----	--	------------	-----	------	------------

UNIT III					
NETWORK ARCHITECTURE AND THE PROCESSES					
5G architecture and core- Network slicing – Multi access edge computing (MEC) visualization of 5G components – End to end system architecture. Service continuity – Relation to EPC and edge computing – 5G protocols: NAS, NGAP, GTP-U, IPsec and GRE.					
PART – A					
Q. No	Questions	CO	BT Level	Competence	
1.	Define 5G Core Network (5GC).	CO3	BTL 1	Remembering	
2.	What is meant by Network Slicing in 5G?	CO3	BTL 1	Remembering	
3.	Define Multi-Access Edge Computing (MEC).	CO3	BTL 1	Remembering	
4.	List any four components of the 5G Core Network.	CO3	BTL 1	Remembering	
5.	What is the function of the AMF (Access and Mobility Management Function)?	CO3	BTL 1	Remembering	
6.	State the purpose of the SMF (Session Management Function).	CO3	BTL 1	Remembering	
7.	What is meant by End-to-End (E2E) System Architecture in 5G?	CO3	BTL 1	Remembering	
8.	Define Service Continuity in 5G networks.	CO3	BTL 1	Remembering	
9.	What does EPC stand for?	CO3	BTL 1	Remembering	
10.	Name the major protocol layers used in the 5G Core Network.	CO3	BTL 1	Remembering	
11.	Expand NAS and state its full form.	CO3	BTL 1	Remember	
12.	What is NGAP?	CO3	BTL 1	Remembering	
13.	Why is Network Slicing required in 5G networks?	CO3	BTL 2	Understanding	
14.	Differentiate between 5G Core (5GC) and Evolved Packet Core (EPC).	CO3	BTL 2	Understanding	
15.	How does Multi-Access Edge Computing (MEC) reduce network latency?	CO3	BTL 2	Understanding	
16.	What is the relationship between Edge Computing and 5G services?	CO3	BTL 2	Understanding	
17.	State the role of the User Plane Function (UPF) in 5G architecture.	CO3	BTL 2	Understanding	
18.	What is the significance of Service Continuity in 5G networks?	CO3	BTL 2	Understanding	
19.	Summarize the importance of End-to-End System Architecture in 5G.	CO3	BTL 2	Understanding	
20.	Outline the purpose of the NAS protocol in 5G communication.	CO3	BTL 2	Understanding	
21.	State the function of NGAP in the 5G network architecture.	CO3	BTL 2	Understanding	
22.	What is the role of GTP-U in user data transmission?	CO3	BTL 2	Understanding	
23.	Identify the purpose of IPsec in 5G networks.	CO3	BTL 2	Understanding	
24.	Compare GRE and IPsec protocols used in 5G networks.	CO3	BTL 2	Understanding	
PART- B					
1.	Explain the architecture of the 5G Core Network and its functional entities.	(16)	CO3	BTL 3	Applying

2.	a) Explain the architecture and components of Network Slicing. b) Demonstrate how Network Slicing supports diverse service requirements.	(8) (8)	CO3	BTL 3	Applying
3.	Apply Multi-Access Edge Computing (MEC) concepts to enhance 5G services.	(16)	CO3	BTL 3	Applying
4.	Explain the visualization of 5G network components in an end-to-end communication system.	(16)	CO3	BTL 3	Applying
5.	a) Explain the Radio Access Network and Core Network architecture. b) Describe the end-to-end communication flow in 5G.	(8) (8)	CO3	BTL 3	Applying
6.	Explain the concept of service continuity in 5G networks.	(16)	CO3	BTL 3	Applying
7.	Apply the concepts of EPC and Edge Computing in 5G deployment.	(16)	CO3	BTL 3	Applying
8.	a) Describe the architecture and functions of NAS. b) Explain NAS signaling procedures for registration and mobility management.	(8) (8)	CO3	BTL 3	Applying
9.	Illustrate the operation of NGAP protocol in 5G networks.	(16)	CO3	BTL 3	Applying
10.	Analyze the significance of Network Slicing in enabling diverse 5G services.	(16)	CO3	BTL 4	Analyzing
11.	Analyze the role of MEC in supporting emerging 5G applications.	(16)	CO3	BTL 4	Analyzing
12.	Compare and analyze the relationship between EPC and 5G Core architecture.	(16)	CO3	BTL 4	Analyzing
13.	Analyze the End-to-End architecture of a 5G network.	(16)	CO3	BTL 4	Analyzing
14.	Analyze the role of GTP-U protocol in 5G communication systems.	(16)	CO3	BTL 4	Analyzing
15.	Analyze the importance of IPsec in securing 5G networks.	(16)	CO3	BTL 4	Analyzing
16.	Analyze the GRE protocol and its applications in 5G networks.	(16)	CO3	BTL 4	Analyzing
17.	Analyze the interaction among NAS, NGAP, GTP-U, IPsec, and GRE protocols in 5G networks.	(16)	CO3	BTL 4	Analyzing

UNIT IV				
DYNAMIC SPECTRUM MANAGEMENT AND SECURITY IN 5G NETWORKS				
Mobility management- Command and control- Spectrum sharing and spectrum trading- Security features in 5G networks- Network domain security- User domain security- Flow based QoS framework – Mitigating- The threats in 5G.				
PART – A				
Q. No	Questions	CO	BT Level	Competence
1.	What is mobility management in 5G networks?	CO4	BTL 1	Remembering
2.	Define handover in mobile communication systems.	CO4	BTL 1	Remembering
3.	What is command and control (C2) communication?	CO4	BTL 1	Remembering

4.	What is spectrum sharing?	CO4	BTL 1	Remembering
5.	Define spectrum trading.	CO4	BTL 1	Remembering
6.	What is dynamic spectrum access?	CO4	BTL 1	Remembering
7.	What is network domain security?	CO4	BTL 1	Remembering
8.	What is user domain security?	CO4	BTL 1	Remembering
9.	Expand the term QoS.	CO4	BTL 1	Remembering
10.	What is a QoS flow in 5G networks?	CO4	BTL 1	Remembering
11.	What is authentication in 5G security?	CO4	BTL1	Remembering
12.	What is encryption?	CO4	BTL1	Remembering
13.	Classify the types of handovers used in 5G networks.	CO4	BTL 2	Understanding
14.	Summarize the purpose of mobility management in 5G systems.	CO4	BTL 2	Understanding
15.	Differentiate between spectrum sharing and spectrum trading.	CO5	BTL 2	Understanding
16.	Distinguish between licensed and unlicensed spectrum.	CO5	BTL 2	Understanding
17.	Compare network domain security and user domain security.	CO5	BTL 2	Understanding
18.	Differentiate between authentication and authorization.	CO5	BTL 2	Understanding
19.	State the significance of security features in 5G networks.	CO5	BTL 2	Understanding
20.	Outline the role of QoS in 5G communication.	CO5	BTL 2	Understanding
21.	Identify the key parameters used in a flow-based QoS framework.	CO5	BTL 2	Understanding
22.	Classify the major security threats in 5G networks.	CO5	BTL 2	Understanding
23.	State the need for threat mitigation mechanisms in 5G systems.	CO5	BTL 2	Understanding
24.	Identify the objectives of spectrum management in 5G networks.	CO5	BTL 2	Understanding

PART- B

1.	Explain the mobility management architecture in 5G networks and demonstrate how seamless mobility is achieved during handover procedures.	(16)	CO4	BTL 3	Applying
2.	Analyze the challenges associated with mobility management in 5G networks and discuss the techniques used to overcome them.	(16)	CO4	BTL 4	Analyzing
3.	Illustrate the role of mobility management entities in maintaining service continuity and session management in 5G networks.	(16)	CO4	BTL 3	Analyzing
4.	Analyze the role of Command and Control systems in enabling autonomous vehicles, smart grids, and industrial automation applications.	(16)	CO4	BTL 4	Analyzing
5.	Explain the Command and Control (C2) framework in 5G networks and discuss its applications in mission-critical communications and IoT systems.	(16)	CO4	BTL 3	Applying
6.	Compare and analyze spectrum sharing and spectrum trading mechanisms with respect to efficiency, flexibility, and economic benefits.	(16)	CO4	BTL 3	Applying
7.	Apply the concept of spectrum sharing in 5G networks and explain how it improves spectrum utilization and network capacity.	(16)	CO4	BTL 3	Analyzing
8.	Analyze the security architecture of 5G networks and discuss how it differs from previous-generation wireless systems.	(16)	CO4	BTL 3	Applying
9.	Explain the concept of spectrum trading and discuss its	(16)	CO4	BTL 4	Analyzing

	significance in efficient spectrum management for future wireless networks.				
10.	Analyze the functions and significance of Network Domain Security and User Domain Security in protecting 5G communication systems.	(16)	CO5	BTL 3	Applying
11.	Describe the security features incorporated in 5G networks and explain how they enhance confidentiality, integrity, and availability.	(16)	CO5	BTL 3	Applying
12.	Analyze the Flow-Based QoS framework and evaluate its effectiveness in supporting eMBB, URLLC, and mMTC services.	(16)	CO4	BTL 4	Analyzing
13.	Explain the architecture and functions of Network Domain Security (NDS) in protecting 5G network infrastructure.	(16)	CO5	BTL 4	Analyzing
14.	Analyze various security threats in 5G networks, including attacks on network slicing, virtualization, and edge computing environments.	(16)	CO5	BTL 4	Analyzing
15.	Describe User Domain Security in 5G networks and explain the authentication and authorization mechanisms employed to secure user access.	(16)	CO5	BTL 3	Applying
16.	Analyze the threat mitigation techniques employed in 5G networks and discuss their effectiveness in ensuring secure and reliable communication.	(16)	CO5	BTL 3	Applying
17.	Explain the Flow-Based QoS framework in 5G networks and discuss its role in supporting diverse service requirements.	(16)	CO5	BTL 4	Analyzing

UNIT V EMERGING 6G TECHNOLOGIES				
Evolution from 5G to 6G: Motivation and vision -Terahertz (THz) communication: Spectrum, challenges, hardware - Visible Light Communication (VLC) and Optical Wireless Communication- Reconfigurable Intelligent Surfaces (RIS) - Quantum Communication.				
PART - A				
Q. No	Questions	CO	BT Level	Competence
1.	Define 6G communication.	CO6	BTL 1	Remembering
2.	State any two limitations of 5G that motivate the development of 6G.	CO6	BTL 1	Remembering
3.	What is meant by Terahertz (THz) communication?	CO6	BTL 1	Remembering
4.	Specify the frequency range of the THz spectrum.	CO6	BTL 1	Remembering
5.	List any two applications of THz communication.	CO6	BTL 1	Remembering
6.	What is Visible Light Communication (VLC)?	CO6	BTL 1	Remembering
7.	Name the light source commonly used in VLC systems.	CO6	BTL 1	Remembering
8.	Define Optical Wireless Communication (OWC).	CO6	BTL 1	Remembering
9.	What is a Reconfigurable Intelligent Surface (RIS)?	CO6	BTL 1	Remembering

10.	Mention any two components of an RIS.		CO6	BTL 1	Remembering
11.	Define Quantum Communication.		CO6	BTL 1	Remembering
12.	What is a qubit in quantum communication?		CO6	BTL 1	Remembering
13.	Explain the need for 6G networks beyond 5G.		CO6	BTL 2	Understanding
14.	Summarize the key vision of 6G communication systems.		CO6	BTL 2	Understanding
15.	Explain why the THz spectrum is considered suitable for future wireless communications.		CO6	BTL 2	Understanding
16.	Describe the impact of atmospheric absorption on THz communication.		CO6	BTL 2	Understanding
17.	Explain any two hardware challenges in implementing THz communication systems.		CO6	BTL 2	Understanding
18.	Compare VLC and RF communication in terms of spectrum usage.		CO6	BTL 2	Understanding
19.	Discuss the working principle of Visible Light Communication.		CO6	BTL 2	Understanding
20.	Explain the advantages of Optical Wireless Communication over conventional wireless systems.		CO6	BTL 2	Understanding
21.	Describe how RIS improves wireless signal propagation.		CO6	BTL 2	Understanding
22.	Explain the significance of programmable metasurfaces in RIS technology.		CO6	BTL 2	Understanding
23.	Discuss the basic principle of quantum communication.		CO6	BTL 2	Understanding
24.	Explain how quantum communication enhances communication security.		CO6	BTL 2	Understanding
PART- B					
1.	Explain the motivation behind the evolution from 5G to 6G. Analyze the key performance requirements and applications that necessitate the transition to 6G networks.	(16)	CO6	BTL 4	Analyzing
2.	Apply the concepts of 6G communication to design a smart city scenario. Discuss how 6G technologies can improve connectivity, latency, and user experience.	(16)	CO6	BTL 4	Analyzing
3.	Analyze the Terahertz (THz) spectrum and explain its significance in 6G communication systems. Compare THz communication with millimeter-wave communication.	(16)	CO6	BTL 3	Applying
4.	A wireless communication system requires ultra-high data rates for holographic communication. Apply THz communication principles to propose a suitable transmission architecture and justify your choices.	(16)	CO6	BTL 3	Applying
5.	Analyze the major propagation challenges encountered in THz communication systems, including atmospheric absorption, molecular attenuation, and blockage effects.	(16)	CO6	BTL 4	Analyzing
6.	Explain the hardware requirements of THz communication systems. Analyze the challenges involved in designing THz transceivers, antennas, and signal processing circuits.	(16)	CO6	BTL 4	Analyzing
7.	Apply suitable mitigation techniques to overcome the challenges of THz communication in indoor and outdoor environments. Discuss their effectiveness.	(16)	CO6	BTL 3	Applying
8.	Explain the working principle of Visible Light Communication (VLC). Analyze its advantages and limitations when compared with conventional RF communication systems.	(16)	CO6	BTL 4	Analyzing

9.	A hospital requires interference-free wireless communication. Apply VLC technology to design an appropriate communication system and evaluate its performance.	(16)	CO6	BTL 4	Analyzing
10.	Analyze the architecture of Optical Wireless Communication (OWC) systems. Compare VLC, Infrared Communication, and Free Space Optical Communication in terms of performance and applications.	(16)	CO6	BTL 4	Analyzing
11.	Explain the concept and operation of Reconfigurable Intelligent Surfaces (RIS). Analyze how RIS can improve coverage, energy efficiency, and spectral efficiency in 6G networks.	(16)	CO6	BTL 3	Applying
12.	Consider a wireless communication environment with severe signal blockage. Apply RIS technology to improve communication reliability and discuss the expected performance gains.	(16)	CO6	BTL 3	Applying
13.	Analyze the design parameters and deployment challenges of RIS-assisted communication systems in practical wireless networks.	(16)	CO6	BTL 4	Analyzing
14.	Explain the fundamentals of Quantum Communication. Analyze the role of quantum mechanics principles such as superposition and entanglement in secure communications.	(16)	CO6	BTL 3	Applying
15.	Apply Quantum Key Distribution (QKD) concepts to establish a secure communication link between two users. Discuss the advantages over classical cryptographic methods.	(16)	CO6	BTL 3	Applying
16.	Analyze the architecture, benefits, and limitations of Quantum Communication systems. Discuss the challenges involved in integrating quantum communication with future 6G networks.	(16)	CO6	BTL 4	Analyzing
17.	Compare and analyze THz Communication, VLC, RIS, and Quantum Communication technologies in terms of spectrum utilization, performance, security, and suitability for 6G applications.	(16)	CO6	BTL 4	Analyzing