

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING QUESTION BANK



VI SEMESTER

1906602 – WIRELESS NETWORKS

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SUBJECT : 1906602 – Wireless Networks
SEM / YEAR: VI / III Year

UNIT I – WIRELESS LAN

Introduction-WLAN technologies: - IEEE802.11: System architecture, Protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, Wireless HART.

Part – A

Q. No	Questions	CO	BTL	Competence
1.	State the principle of Infrared technology.	CO1	BTL 1	Remembering
2.	List the advantages of wireless LAN.	CO1	BTL 2	Understanding
3.	Point out the major issues in WLAN.	CO1	BTL 1	Remembering
4.	Mention the significance of radio transmission over infrared.	CO1	BTL 1	Remembering
5.	Write the significance of the special control packets in IEEE 802.11.	CO1	BTL 1	Remembering
6.	List the services provided by IEEE802.11.	CO1	BTL 1	Remembering
7.	Why the PHY layer of IEEE 802.11 is subdivided?	CO1	BTL 2	Understanding
8.	Identify the need of WATM systems.	CO1	BTL 2	Understanding
9.	Define HIPERLAN.	CO1	BTL 1	Remembering
10.	Tabulate any three differences between HiperLAN-1 and HiperLAN-2.	CO1	BTL 2	Understanding
11.	Summarize the basic modes of operation in HiperLAN-2.	CO1	BTL 2	Understanding
12.	Give the protocol stack involved for Bluetooth communication.	CO1	BTL 1	Remembering
13.	Draw the typical frame format of Wireless ATM.	CO1	BTL 2	Understanding
14.	List the elements of Bluetooth core protocol.	CO1	BTL 2	Understanding
15.	Write about the power saving mechanism in Bluetooth.	CO1	BTL 1	Remembering
16.	How do IEEE 802.11 and Bluetooth respectively solve the hidden terminal problem?	CO1	BTL 2	Understanding
17.	Differentiate between piconet and scatternet.	CO1	BTL 2	Understanding
18.	Summarize the requirements of handover.	CO1	BTL 2	Understanding
19.	Identify the need of 250 ohms resistor in HART protocol?	CO1	BTL 2	Understanding
20.	Outline the challenges in 6LoWPAN.	CO1	BTL 2	Understanding

21.	What is meant by BRAN?		CO1	BTL 1	Remembering
22.	Write about Zigbee and mention its frequency range.		CO1	BTL 1	Remembering
23.	List the three phases in channel access in HIPERLAN-1?		CO1	BTL 2	Understanding
24.	Name any two MAC mechanism used in IEEE 802.11 WLAN system.		CO1	BTL 1	Remembering
Part – B					
1.	(i) What are the design goals and applications of wireless LAN. (ii) Mention the advantages and disadvantages of WLAN.	(6) (7)	CO1	BTL 3	Applying
2.	Write a brief note on basic transmission technologies for WLANs.	(13)	CO1	BTL 3	Applying
3.	Interpret the two network architectures of WLAN. Discuss them briefly with diagrams.	(13)	CO1	BTL 3	Applying
4.	Summarize three versions of PHY layer with the format of an IEEE 802.11 PHY frame.	(13)	CO1	BTL 4	Analyzing
5.	Describe the basic structure of an IEEE 802.11 MAC data frame and also explain the special control packets.	(13)	CO1	BTL 4	Analyzing
6.	(i) List out the services provided by WATM. (ii) Sketch the generic WATM reference model.	(6) (7)	CO1	BTL 3	Applying
7.	Assess the four different network types and layered Model of BRAN wireless access network.	(13)	CO1	BTL 3	Applying
8.	Analyze the basic handover scenarios of structure and 0Hiper LAN2 with necessary diagrams.	(13)	CO1	BTL 4	Analyzing
9.	(i) State the functions covered by Link Manager Protocols. (ii) What are the three low power states in Bluetooth device.	(6) (7)	CO1	BTL 3	Applying
10.	Elaborate how you would form a piconet and scatternet in Bluetooth with architecture diagram.	(13)	CO1	BTL 3	Applying
11.	Describe the steps involved in the security architecture of Bluetooth.	(13)	CO1	BTL 4	Analyzing
12.	Infer the characteristics and architecture of IEEE 802.15.4 WPAN.	(13)	CO1	BTL 4	Analyzing
13.	Construct the protocol architecture and categorize the data transfer types of Wireless Universal Serial Bus (WUSB).	(13)	CO1	BTL 3	Applying
14.	(i) Discuss about Zigbee Topologies with diagram. (ii) Draw and explain the architecture of Wireless HART.	(6) (7)	CO1	BTL 4	Analyzing
15.	(i) Explain 6LoWPAN with architecture. (ii) Illustrate with an example the media access control mechanism of DCF methods adopted in IEEE 802.11 WLAN.	(7) (6)	CO1	BTL 4	Analyzing

16.	Analyze HiperLAN in detail.	(13)	CO1	BTL 4	Analyzing
17.	Discuss IEEE 802.15.4 Protocol in detail	(13)	CO1	BTL 3	Applying
Part – C					
1.	Illustrate the following IEEE 802.11 architecture with neat diagrams: (i) System architecture (ii) Protocol architecture	(7) (8)	CO1	BTL 3	Applying
2.	(i) Elaborate the PHY packet formats of IEEE 802.11b and IEEE 802.11a. (ii) Consider an OFDM system that uses 52 subcarriers out of which 48 are data sub-carriers and 4 are pilot sub carriers. System bandwidth is 20MHz and OFDM symbol duration including cyclic prefix with guard interval for ISI mitigation is 4μs. If code rate is $\frac{3}{4}$ and 64 QAM is used, what is the data rate?	(12) (3)	CO1	BTL 4	Analyzing
3.	Assess the core protocol elements in Bluetooth protocol stack with necessary diagrams.	(15)	CO1	BTL 4	Analyzing
4.	Formulate the architecture and protocol stack of 6LoWPAN and explain the concept of header compression with an example.	(15)	CO1	BTL 3	Applying
5.	Explain the working principle of the following (i) WATM (ii) Bluetooth Architecture	(7) (8)	CO1	BTL 3	Applying

UNIT II – MOBILE NETWORK LAYER

Introduction - Mobile IP: IP packet delivery, Agent discovery, Tunnelling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - Mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP.

Part – A

Q.No	Questions	CO	BTL	Competence
1.	Define mobile node.	CO2	BTL 1	Remembering
2.	What are the requirements of mobile IP?	CO2	BTL 1	Remembering
3.	Mention the different entities in mobile IP.	CO2	BTL 2	Understanding
4.	What is meant by Care-of address in Mobile IP?	CO2	BTL 1	Remembering
5.	Differentiate between encapsulation and decapsulation.	CO2	BTL 2	Understanding
6.	State the importance of tunneling.	CO2	BTL 1	Remembering
7.	Classify the agent discovery methods and provide a brief explanation of each.	CO2	BTL 2	Understanding

8.	In what way Foreign Agent help MN during its visit to foreign network?	CO2	BTL 2	Understanding
9.	Sketch the frame format of the IP-in-IP encapsulation.	CO2	BTL 1	Remembering
10.	Draw the frame format for registration request.	CO2	BTL 2	Understanding
11.	Identify the four additional messages needed by the optimized mobile IP.	CO2	BTL 2	Understanding
12.	List the advantages of minimal encapsulation.	CO2	BTL 1	Remembering
13.	What is Generic Routing Encapsulation (GRE) and where is it used?	CO2	BTL 1	Remembering
14.	List the advantages and disadvantages of Hawaii architecture?	CO2	BTL 2	Understanding
15.	Draw the basic architecture of cellular IP.	CO2	BTL 2	Understanding
16.	Summarize the salient features of IPv6.	CO2	BTL 2	Understanding
17.	Name the responsibilities of network layer.	CO2	BTL 1	Remembering
18.	How can DHCP be used for mobility and support of mobile IP?	CO2	BTL 2	Understanding
19.	What are the characteristics of MANET?	CO2	BTL 1	Remembering
20.	Outline the functions of SIP.	CO2	BTL 2	Understanding
21.	What are the possible enhancements that can be added to the distance vector algorithm?	CO2	BTL 1	Remembering
22.	How is routing divided in DSR?	CO2	BTL 2	Understanding
23.	Which layer is CoAP in IoT?	CO2	BTL 2	Understanding
24.	Why are special protocols needed to support micromobility at the network layer?	CO2	BTL 1	Remembering

Part – B

1.	Describe the entities and terminology used in Mobile IP and explain their roles.	(13)	CO2	BTL 3	Applying
2.	What is Mobile IP? Describe the Mobile IP protocol. Explain with a diagram, how IP packets are transmitted between nodes.	(13)	CO2	BTL 3	Applying
3.	Mention the need of agent advertisement with packet format and explain the methods of operation.	(13)	CO2	BTL 4	Analyzing
4.	(i) Draw and explain the packet format of registration request and reply. (ii) Name the registration reply codes in mobile IP.	(6) (7)	CO2	BTL 3	Applying
5.	Outline the mechanism of encapsulation and explain the methods of encapsulation.	(13)	CO2	BTL 3	Applying
6.	Explain the protocol fields and simplified header of Generic Routing Encapsulation (GRE).	(13)	CO2	BTL 3	Applying
7.	Draw the basic structure of Cellular IP and HAWAII architecture, and explain each component in detail.	(13)	CO2	BTL 4	Analyzing

8.	(i) Explain the characteristics of the client/server model of Dynamic Host Configuration Protocol (DHCP) in detail. (ii) Explain the flow of DHCP client initialization process.	(6) (7)	CO2	BTL 3	Applying
9.	Interpret the main idea of optimization and reverse tunneling.	(13)	CO2	BTL 3	Applying
10.	(i) Illustrate the header format of IPv6 with the diagram. (ii) Describe about the basic structure of hierarchical mobile IPv6.	(6) (7)	CO2	BTL 3	Applying
11.	Elaborate the internet addresses and the IP adjunct protocol of the network layer in the internet.	(13)	CO2	BTL 4	Analyzing
12.	Explain the purpose of Session Initiation Protocol (SIP) and how it works in a VoIP call in detail.	(13)	CO2	BTL 3	Applying
13.	Examine how does destination sequence distance vector routing protocol is implemented in a network, explain with an example.	(13)	CO2	BTL 4	Analyzing
14.	Illustrate the distinct features of mobile ad hoc network and explain the relation to mobile IP and DHCP.	(13)	CO2	BTL 3	Applying
15.	Explain the main characteristics and architecture of Mobile Ad hoc Networks (MANETs) with a neat diagram.	(13)	CO2	BTL 3	Applying
16.	Analyze the basic components used in IoT and outline the characteristics of IoT.	(13)	CO2	BTL 4	Analyzing
17.	Describe the architecture and functions of constrained application protocol.	(13)	CO2	BTL 4	Analyzing
Part – C					
1.	Illustrate the mechanism of tunneling and encapsulation in mobile IP packet delivery with necessary diagrams.	(15)	CO2	BTL 3	Applying
2.	Imagine the following scenario. A Japanese and a German meet at a conference on Hawaii. Both want to use their laptops for exchanging data, both run mobile IP for mobility support. Explain the optimizations used in the mobile IP networks.	(15)	CO2	BTL 4	Analyzing
3.	Evaluate the process of route establishment and route maintenance in Destination Sequenced Distance Vector Routing protocol for ad hoc networks.	(15)	CO2	BTL 3	Applying
4.	(i) With the IP header format explain the fields of the header used in the network layer in the internet. (ii) Analyze the schemes for QoS support in the internet.	(8) (7)	CO2	BTL 4	Analyzing
5.	Explain the working principle of CoAP Protocol with architecture and message format.	(15)	CO2	BTL 3	Applying

UNIT III – 3G OVERVIEW

Overview of UMTS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, UMTS Interfaces, Mobility Management for UMTS Network, CDMA2000 overview-Radio and Network components, Network structures, Radio Network, TD - CDMA, TD –SCDMA.

Part – A

Q. No	Questions	CO	BTL	Competence
1.	What is UMTS?	CO3	BTL 1	Remembering
2.	Name the three main entities of the UMTS network.	CO3	BTL 2	Understanding
3.	How to handle the mobility in the UTRAN?	CO3	BTL 2	Understanding
4.	List the elements of UTRAN architecture.	CO3	BTL 2	Understanding
5.	Define user equipment.	CO3	BTL 2	Understanding
6.	List the responsibilities of RNC in the RNS.	CO3	BTL 1	Remembering
7.	Draw the UTRAN logical architecture.	CO3	BTL 1	Remembering
8.	Summarize the characteristics of Control plane and User plane.	CO3	BTL 2	Understanding
9.	Outline the functions of 3G-GGSN.	CO3	BTL 2	Understanding
10.	What is the use of DHCP?	CO3	BTL 1	Remembering
11.	What are the bearer services in a UMTS layered architecture?	CO3	BTL 1	Remembering
12.	Mention the need of firewall in a network.	CO3	BTL 1	Remembering
13.	Interpret the significance of 3 rd Generation Partnership Project.	CO3	BTL 2	Understanding
14.	How does the AAA server contribute to CDMA2000?	CO3	BTL 1	Remembering
15.	What is the contribution of packet data serving node in cdma2000?	CO3	BTL 1	Remembering
16.	Where do we use CDMA2000?	CO3	BTL 2	Understanding
17.	Mention the major functions of PDSN.	CO3	BTL 1	Remembering
18.	What is the network structure of CDMA 2000?	CO3	BTL 1	Remembering
19.	Name the main variants in configuring CDMA2000 network.	CO3	BTL 1	Remembering
20.	Identify the enhancements in radio network of CDMA2000 over the existing IS-95/J-STD-008.	CO3	BTL 2	Understanding
21.	Summarize the concept of TD-CDMA.	CO3	BTL 2	Understanding
22.	Outline the techniques used in TD-CDMA.	CO3	BTL 2	Understanding
23.	What is the channel structure of TD-SCDMA?	CO3	BTL 1	Remembering
24.	Write the list of elements used in TD-SCDMA.	CO3	BTL 2	Understanding

Part – B

1.	Sketch the architecture of UTRAN with its elements and explain in detail.	(13)	CO3	BTL 3	Applying
2.	Summarize the following in detail:		CO3	BTL 3	Applying

	(i) UTRAN Interfaces, (ii) Transport Network Control plane, (iii) Transport Network User plane.	(5) (3) (5)	CO3		
3.	Illustrate the functional entities needed to support PS services and CS services in UMTS core network architecture.	(13)	CO3	BTL 3	Applying
4.	Draw the UMTS bearer service layered architecture and explain the service in detail.	(13)	CO3	BTL 4	Analyzing
5.	Illustrate the logical architecture of the UMTS core network with an appropriate diagram.	(13)	CO3	BTL 3	Applying
6.	How mobility management is achieved in a UMTS network?	(13)	CO3	BTL 3	Applying
7.	(i)Examine the objectives and operational principles of HSDPA. (ii)Describe the channels introduced in HSDPA.	(6) (7)	CO3	BTL 4	Analyzing
8.	Explain in detail about the overview and system architecture of CDMA 2000.	(13)	CO3	BTL 3	Applying
9.	Compare the distribute network, regional network and centralized network.	(13)	CO3	BTL 4	Analyzing
10.	With the necessary diagram explain the radio network services of cdma2000.	(13)	CO3	BTL 4	Analyzing
11.	Describe the following in detail: (i)Packet Data Serving Node (PDSN) in cdma2000, (ii) Base Transceiver Station (BTS).	(6) (7)	CO3	BTL 3	Applying
12.	Examine the Network structure of CDMA 2000 and its three main variants.	(13)	CO3	BTL 3	Applying
13.	Determine how the forward channel and reverse channel allocation performed in cdma2000.	(13)	CO3	BTL 4	Analyzing
14.	Summarize the forward link features of CDMA2000 and write about the modulation schemes associated.	(13)	CO3	BTL 3	Applying
15.	(i)Analyze power control mechanism used in cdma2000. (ii)Assess how Walsh code administration performed in cdma2000.	(7) (6)	CO3	BTL 3	Applying
16.	Generalize the fundamental architecture of a Time Division Code Division Multiple Access (TD-CDMA) and core network.	(13)	CO3	BTL 4	Analyzing
17.	Elaborate the architecture of Generic TD-SCDMA network.	(13)	CO3	BTL 3	Applying

Part – C

1.	Explain the Radio Access Network Application Protocol and its functions.	(15)	CO3	BTL 3	Applying
2.	With the UMS core network architecture analyze the functions in different areas.	(15)	CO3	BTL 4	Analyzing
3.	Describe the following CDMA 2000 Radio and Network components platforms: (i) Packet Data Serving Node (PDSN), (ii) Home Location Register (HLR), (iii) Base Transceiver Station (BTS).	(5) (5) (5)	CO3	BTL 3	Applying

4.	Illustrate the data rates and characteristics for Forward link RC and SR and Reverse link RC and SR.	(15)	CO3	BTL 3	Applying
5.	Assess the core network associated with TD-SCDMA wireless network for Release 5.	(15)	CO3	BTL 4	Analyzing

UNIT IV – INTERNETWORKING BETWEEN WLANS AND WWANS

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

Part – A

Q. No	Questions	CO	BTL	Competence
1.	List the internetworking requirements.	CO4	BTL 1	Remembering
2.	Categorize the internetworking schemes.	CO4	BTL 2	Understanding
3.	Interpret the gateway approach to internetwork WLANs and 3G networks.	CO4	BTL 2	Understanding
4.	Sketch the architecture of emulator approach.	CO4	BTL 2	Understanding
5.	Define session.	CO4	BTL 1	Remembering
6.	Name the generic approaches of internetworking.	CO4	BTL 1	Remembering
7.	What is the trend followed in loose coupling?	CO4	BTL 1	Remembering
8.	Write the functions of tight coupling in internetworking.	CO4	BTL 1	Remembering
9.	Show the tight coupling architecture between WLAN and GPRS.	CO4	BTL 2	Understanding
10.	Outline the main function of GIF.	CO4	BTL 2	Understanding
11.	How system mobility is achieved?	CO4	BTL 1	Remembering
12.	What are the interfaces related to the mobile station, and how are they implemented?	CO4	BTL 1	Remembering
13.	Mention the attributes of QoS in the uplink direction.	CO4	BTL 2	Understanding
14.	List the key components of GPRS architecture.	CO4	BTL 2	Understanding
15.	Summarize the features of LMDS.	CO4	BTL 2	Understanding
16.	Compare the multipoint structure of LMDS with a point-to-point communication system.	CO4	BTL 2	Understanding
17.	Identify the advantages of LMDS for broadband.	CO4	BTL 2	Understanding
18.	Classify the present IEEE 802.16 standards.	CO4	BTL 2	Understanding
19.	State the main applications of MMDS in communication systems.	CO4	BTL 1	Remembering
20.	Summarize the significance of access schemes in enabling efficient communication in MMDS..	CO4	BTL 2	Understanding
21.	Identify the key functions performed by internetworking devices.	CO4	BTL 1	Remembering
22.	List the specifications of LMDS.	CO4	BTL 2	Understanding
23.	Discuss the enhancements carried out in UMTS.	CO4	BTL 2	Understanding

24.	Define the GPRS.		CO4	BTL 1	Remembering
Part – B					
1.	How would you implement seamless handover between WWAN and WLAN to ensure uninterrupted service?	(13)	CO4	BTL 3	Applying
2.	Draw the different architectures to connect WLANs and 3G Networks.	(13)	CO4	BTL 3	Remembering
3.	(i) Explain about the tight coupling architecture in detail.	(5)	CO4	BTL 3	Applying
	(ii) Describe the internetworking architecture between the IEEE 802.11 WLAN and GPRS.	(8)			
4.	(i) Illustrate the tight coupling over Gb interface with necessary diagram.	(7)	CO4	BTL 3	Applying
	(ii) Elaborate the approaches for transporting the GPRS signaling and user data.	(6)			
5.	Analyze the components of WAF and their integration with the WWAN core network.	(13)	CO4	BTL 4	Analyzing
6.	How would you describe the role of the GPRS Interworking Function (GIF) in tight coupling architecture?	(13)	CO4	BTL 3	Applying
7.	Analyze the integration of IEEE 802.11 WLAN and GPRS using loose coupling.	(13)	CO4	BTL 4	Analyzing
8.	(i) Brief the WLAN system architecture reusing the 3GPP subscription.	(6)	CO4	BTL 3	Applying
	(ii) How is authentication achieved in loose coupling architecture?	(7)			
9.	Explain the SIM based authentication over WLAN.	(13)	CO4	BTL 3	Applying
10.	Compare tight and loose coupling architecture for interworking between IEEE 802.11 WLAN and GPRS.	(13)	CO4	BTL 4	Analyzing
11.	Describe the operating principle of local multipoint distribution system.	(13)	CO4	BTL 3	Applying
12.	(i) Write the significant features of LMDS.	(6)	CO4	BTL 3	Applying
	(ii) With an example explain the LMDS configuration.	(7)			
13.	(i) Illustrate the MMDS system for digital video and wireless internet.	(8)	CO4	BTL 4	Analyzing
	(ii) Summarize the functional operation of MMDS.	(5)			
14.	Examine the multichannel multipoint distribution system (MMDS). Distinguish it with LMDS.	(13)	CO4	BTL 4	Analyzing
15.	Elaborate the details on the schemes to connect WLAN and 3G networks.	(13)	CO4	BTL 3	Applying

16.	How does the 3G GGSN/MSC differ from the GPRS architecture elements (3G GGSN/MSC)? What sort of enhancements are carried out in UMTS to meet out its specifications.	(13)	CO4	BTL 3	Applying
17.	Inspect the transaction-oriented TCP and TCP over 2.5G/3G wireless networks.	(13)	CO4	BTL 4	Analyzing
Part – C					
1.	Examine the tight coupling system configuration of WLAN-GPRS.	(15)	CO4	BTL 3	Applying
2.	(i) Elaborate the features of WLAN coupling points using the GPRS reference diagram.	(8)	CO4	BTL 3	Applying
	(ii) Devise a system description for a tight coupling in a internetworking between WLAN and GPRS.	(7)			
3.	How would you describe the process of data transfer between WLAN and GPRS in a loose coupling interface?	(15)	CO4	BTL 3	Applying
4.	(i) Infer the different modulation schemes adopted in LMDS.	(5)	CO4	BTL 4	Analyzing
	(ii) Examine the components of the LMDS architecture.	(10)			
5.	Analyze the local multipoint distribution service and multichannel multipoint distribution system.	(15)	CO4	BTL 4	Analyzing

UNIT V – 4G & BEYOND

Introduction – 4G vision – 4G features and challenges - Step towards 4G Networks - Why Integration, Benefits of Integration Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

Part – A

Q. No	Questions	CO	BTL	Competence
1.	Write about 4G network.	CO5	BTL 1	Remembering
2.	How the vision of 4G system is stated?	CO5	BTL 1	Remembering
3.	Mention the challenges of 4G.	CO5	BTL 2	Understanding
4.	Is it possible to get 4G services on the 3G phone? Justify your answer.	CO5	BTL 2	Understanding
5.	Which are all the technologies that can be applied in 4G services?	CO5	BTL 2	Understanding
6.	Identify the techniques to improve network survivability in different layers and name the challenges faced by 4G.	CO5	BTL 2	Understanding
7.	State the design challenges of 4G system.	CO5	BTL 1	Remembering
8.	Outline the new developments in 4G.	CO5	BTL 2	Understanding

9.	Compare the service quality challenges faced by 4G systems with those in previous generations like 3G.	CO5	BTL 2	Understanding
10.	List the applications of 4G.	CO5	BTL 2	Understanding
11.	Define multicarrier modulation.	CO5	BTL 1	Remembering
12.	Identify the main benefits of implementing receiver diversity in wireless networks.	CO5	BTL 1	Remembering
13.	List the advantages of multi carrier modulation over single carrier modulation schemes.	CO5	BTL 1	Remembering
14.	Classify the smart antenna techniques based on the number of transmitting and receiving antennas.	CO5	BTL 2	Understanding
15.	How does increasing the number of antennas in a MIMO system impact its channel capacity?.	CO5	BTL 2	Understanding
16.	Summarize the features of IP Multimedia Subsystem.	CO5	BTL 2	Understanding
17.	Categorize the layers of IMS architecture.	CO5	BTL 2	Understanding
18.	What are the key requirements of LTE?	CO5	BTL 1	Remembering
19.	Illustrate the issues in terminal mobility.	CO5	BTL 2	Understanding
20.	Summarize the key business models of MVNOs and how they impact the mobile market..	CO5	BTL 2	Understanding
21.	Compare 3G and 4G.	CO5	BTL 2	Understanding
22.	List the features of 4G services.	CO5	BTL 1	Remembering
23.	State the role of smart antennas in improving signal quality and coverage.	CO5	BTL 1	Remembering
24.	Distinguish SISO and SIMO systems.	CO5	BTL 2	Understanding

Part – B

1.	How can you apply advanced technologies like MIMO and beamforming to overcome the capacity limitations in 4G networks?	(13)	CO5	BTL 3	Applying
2.	(i) Write short notes about the evolution of 4G system.	(6)	CO5	BTL 3	Applying
	(ii) Describe the concept of “seamless connectivity” in 4G system and explain with suitable diagrams	(7)			
3.	(i) Identify the key parameters of 4G and compare it with 3G systems	(8)	CO5	BTL 3	Applying
	(ii) Illustrate the 4G vision with appropriate diagram.	(5)			
4.	Summarize the integration of 4G wireless technologies.	(13)	CO5	BTL 3	Applying
5.	(i) Compare the performance of MC-CDMA with OFDM-TDMA.	(8)	CO5	BTL 3	Applying
	(ii) List the different types of MCM techniques.	(5)			
6.	What is OFDM? Write the significance and its advantages in using in 4G wireless communication system.	(13)	CO5	BTL 3	Applying

7.	Assess the smart antenna techniques and explain in detail.		(13)	CO5	BTL 4	Analyzing
8.	(i)	Outline the features of IMS components.	(5)	CO5	BTL 3	Applying
	(ii)	Explain the service architecture and its entities of IMS.	(8)			
9.	Illustrate the structure and compare the different smart antenna techniques used for wireless communication systems.		(13)	CO5	BTL 3	Applying
10.	Explain end to end architecture of LTE network.		(13)	CO5	BTL 3	Applying
11.	Categorize the channels available in LTE network, explain each category elaborately.		(13)	CO5	BTL 4	Analyzing
12.	Analyze the functions and architecture of BWA.		(13)	CO5	BTL 4	Analyzing
13.	(i)	Elaborate the stix agent architecture.	(7)	CO5	BTL 3	Applying
	(ii)	Discuss the bidirectional bandwidth allocation in BWA	(6)			
14.	Determine the categories of MVNO and explain the architecture in detail.		(13)	CO5	BTL 4	Analyzing
15.	Summarize the 4G technologies MCM, and OFDM-MIMO system in detail.		(13)	CO5	BTL 4	Analyzing
16.	Explain how multicarrier modulation techniques contribute to the efficiency and performance of 4G networks.		(13)	CO5	BTL 4	Analyzing
17.	Elaborate the long-term evaluation wireless systems.		(13)	CO5	BTL 3	Applying
Part – C						
1.	Summarize the technologies behind the 4G services and explain in detail.		(15)	CO5	BTL 3	Applying
2.	Analyze the multicarrier modulation scheme adopted in 4G system, explain the working procedure of the scheme with necessary diagram.		(15)	CO5	BTL 4	Analyzing
3.	(i)	Infer about the user plane end-to-end protocol stack based on the protocol architecture of LTE.	(7)	CO5	BTL 4	Analyzing
	(ii)	Inspect the local services offered in LTE system	(8)			
4.	Explain about the effective distributed system as a management goal in broadband wireless access.		(15)	CO5	BTL 3	Applying
5.	Explain the role of adaptive algorithms in smart techniques and how they contribute to real-time adjustments in communication systems.		(15)	CO5	BTL 3	Applying