

**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**  
**Regulation – 2019**  
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*Prepared by*

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## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

### QUESTION BANK

**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	BTL	Competence
1.	State the principle of Infrared technology.	BTL 1	Remembering
2.	List the advantages of wireless LAN.	BTL 1	Remembering
3.	Point out the major issues in WLAN.	BTL 3	Applying
4.	Find the significance of radio transmission over infrared.	BTL 1	Remembering
5.	Write the significance of the special control packets in IEEE 802.11.	BTL 1	Remembering
6.	List the services provided by IEEE802.11.	BTL 1	Remembering
7.	Why the PHY layer of IEEE 802.11 is subdivided?	BTL 4	Analyzing
8.	Identify the need of WATM systems.	BTL 3	Applying
9.	Define HIPERLAN.	BTL 1	Remembering
10.	Tabulate any three differences between HiperLAN-1 and HiperLAN-2.	BTL 2	Understanding
11.	Summarize the basic modes of operation in HiperLAN-2.	BTL 2	Understanding
12.	Infer about the protocol stack involved for Bluetooth communication.	BTL 5	Evaluating
13.	Draw the typical frame format of Wireless ATM.	BTL 4	Analyzing
14.	Interpret the elements of Bluetooth core protocol.	BTL 3	Applying
15.	Evaluate the power saving mechanism in Bluetooth.	BTL 5	Evaluating
16.	How do IEEE 802.11 and Bluetooth respectively solve the hidden terminal problem?	BTL 6	Creating
17.	Differentiate between piconet and scatternet.	BTL 4	Analyzing
18.	Summarize the requirements of handover.	BTL 2	Understanding
19.	Determine the need of 250 ohms resistor in HART protocol?	BTL 6	Creating
20.	Outline the challenges in 6LoWPAN.	BTL 2	Understanding

<b>Part – B</b>				
1.	(i) What are the design goals and applications of wireless LAN. (ii) Menion the advantages and disadvantages of WLAN.	(6) (7)	BTL 1	Remembering
2.	Write a brief note on basic transmission technologies for WLANs.	(13)	BTL 1	Remembering
3.	Interpret the two network architectures of WLAN. Discuss them briefly with diagrams.	(13)	BTL 3	Applying
4.	Summarize three versions of PHY layer with the format of an IEEE 802.11 PHY frame.	(13)	BTL 2	Understanding
5.	Formulate the basic structure of an IEEE 802.11 MAC data frame and also explain the special control packets.	(13)	BTL 6	Creating
6.	(i) List out the sevicees provided by WATM. (ii) Sketch the generic WATM reference model.	(6) (7)	BTL 1	Remembering
7.	Assess the four different network types and layered Model of BRAN wireless access network.	(13)	BTL 5	Evaluating
8.	Analyze the basic structure and handover scenarios of HiperLAN2 with necessary diagrams.	(13)	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)	BTL 1	Remembering
10.	Elaborate how would you form a piconet and scatternet in Bluetooth with architecture diagram.	(13)	BTL 4	Analyzing
11.	Describe the steps involved in the security architecture of Bluetooth.	(13)	BTL 3	Applying
12.	Infer the characteristics and architecture of IEEE 802.15.4 WPAN.	(13)	BTL 2	Understanding
13.	Construct the protocol architecture and categorize the data transfer types of Wireless Universal Serial Bus (WUSB).	(13)	BTL 4	Analyzing
14.	(i) Discuss about Zigbee Topologies with diagram. (ii) Draw and explain architecture of Wireless HART.	(6) (7)	BTL 2	Understanding
<b>Part – C</b>				
1.	Illustrate the following IEEE 802.11 architecture with neat diagrams: (i) System architecture (ii) Protocol architecture	(7) (8)	BTL 5	Evaluating

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)	BTL 6	Creating
3.	Assess the core protocol elements in Bluetooth protocol stack with necessary diagrams.	(15)	BTL 5	Evaluating
4.	Formulate the architecture and protocol stack of 6LoWPAN and explain the concept of header compression with an example.	(15)	BTL 6	Creating

## UNIT II – MOBILE NETWORK LAYER

Introduction - Mobile IP: IP packet delivery, Agent discovery, Tunneling 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	BTL	Competence
1.	Define mobile node.	BTL 1	Remembering
2.	What are the requirements of mobile IP?	BTL 1	Remembering
3.	Mention the different entities in mobile IP.	BTL 1	Remembering
4.	What is meant by Care-of address in Mobile IP.	BTL 1	Remembering
5.	Differentiate between encapsulation and decapsulation.	BTL 3	Applying
6.	Interpret the importance of tunneling.	BTL 3	Applying
7.	How does Foreign Agent help MN during its visit to foreign network?	BTL 6	Creating
8.	Draw the frame format for registration request.	BTL 3	Applying
9.	Identify the four additional messages needed by the optimized mobile IP.	BTL 2	Understanding
10.	Assess the use of generic routing encapsulation.	BTL 5	Evaluating
11.	Examine the advantages and disadvantages of Hawaii architecture?	BTL 4	Analyzing
12.	Draw the basic architecture of cellular IP.	BTL 2	Understanding
13.	Summarize the salient features of IPv6.	BTL 4	Analyzing
14.	List out the responsibilities of network layer.	BTL 1	Remembering
15.	How can DHCP be used for mobility and support of mobile IP?	BTL 4	Analyzing
16.	Outline the functions of SIP.	BTL 2	Understanding
17.	Write the two things added to the distance vector algorithm.	BTL 1	Remembering
18.	How is routing divided in DSR?	BTL 2	Understanding

19.	Which layer is CoAP in IoT?		BTL 5	Evaluating
20.	Justify the need for special protocols to support micro mobility on the network layer.		BTL 6	Creating
Part – B				
1.	Write a brief note on entities and terminology of mobile IP.	(13)	BTL 1	Remembering
2.	What is Mobile IP? Describe the Mobile IP protocol. Explain with a diagram, how IP packets are transmitted between nodes.	(13)	BTL 1	Remembering
3.	Discuss the need of agent advertisement with packet format.	(13)	BTL 4	Analyzing
4.	(ii) Draw and explain the packet format of registration request and reply. (ii) Tabulate the registration reply codes in mobile IP.	(6) (7)	BTL 1	Remembering
5.	Explain the protocol fields and simplified header of Generic Routing Encapsulation (GRE).	(13)	BTL 3	Applying
6.	Formulate the basic structure of cellular IP and HAWAII architecture.	(13)	BTL 6	Creating
7.	(i) Propose a client/server model of Dynamic Host Configuration Protocol. (ii) Evaluate the flow of DHCP client initialization process.	(6) (7)	BTL 5	Evaluating
8.	Summarize the main characteristics and architecture of Mobile Adhoc Networks with neat diagram.	(13)	BTL 2	Understanding
9.	Interpret the main idea of optimization and reverse tunneling.	(13)	BTL 3	Applying
10.	(i) Draw the header format of IPv6. (ii) Infer about the basic structure of hierarchical mobile IPv6.	(6) (7)	BTL 2	Understanding
11.	What is the purpose of Session Initiation Protocol and explain how it works in a VoIP call?	(13)	BTL 1	Remembering
12.	Examine the motivation behind dynamic source and how does dynamic source routing handle routing?	(13)	BTL 4	Analyzing
13.	Illustrate the four components used in IoT and outline the characteristics of IoT.	(13)	BTL 4	Analyzing
14.	(i) Justify How would you solve the problem of triangular routing? (ii) Explain the benefits of Mobile ad-hoc networks.	(6) (7)	BTL 2	Understanding
Part – C				
1.	Illustrate the mechanism of tunneling and encapsulation in mobile IP packet delivery with necessary diagrams.	(15)	BTL 6	Creating

2.	Imagine the following scenario. A Japanese and a German meet at a conference on Hawali. 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)	BTL 6	Creating
3.	Evaluate the process of route establishment and route maintenance in Destination Sequence Distance Vector Routing protocol for adhoc networks.	(15)	BTL 5	Evaluating
4.	Explain the working principle of CoAP Protocol with architecture and message format.	(15)	BTL 5	Evaluating

### 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	BTL	Competence
1.	What is UMTS?	BTL 1	Remembering
2.	How to handle the mobility in the UTRAN.	BTL 1	Remembering
3.	What are the elements of UTRAN architecture?	BTL 3	Applying
4.	Define user equipment.	BTL 2	Understanding
5.	List the responsibilities of RNC in the RNS.	BTL 1	Remembering
6.	Draw the UTRAN logical architecture.	BTL 1	Remembering
7.	Summarize the Control plane and User plane.	BTL 2	Understanding
8.	Evaluate the functions of 3G-GGSN.	BTL 5	Evaluating
9.	Analyze the use of DHCP.	BTL 4	Analyzing
10.	Mention the techniques used in HSDPA.	BTL 1	Remembering
11.	Discuss the known work in 3 <sup>rd</sup> Generation Partnership Project.	BTL 2	Understanding
12.	Differentiate between CDMA2000 1X and 1X EV-DO Rev 0.	BTL 4	Analyzing
13.	Explain the need for CDMA2000.	BTL 4	Analyzing
14.	Mention the major functions of PSN.	BTL 1	Remembering
15.	Deduce the network structure of CDMA 2000.	BTL 5	Evaluating
16.	What are the enhancements over existing IS-95/J-STD-008 wireless	BTL 6	Creating

	systems.		
17.	Interpret the concept of TD-CDMA.	BTL 3	Applying
18.	Outline the techniques used in TD-CDMA.	BTL 2	Understanding
19.	Formulate the channel structure of TD-SCDMA.	BTL 6	Creating
20.	Write the list of elements used in TD-SCDMA.	BTL 3	Applying
<b>Part - B</b>			
1.	Explain the architecture of UTRAN and its elements.	(13)	BTL 4 Analyzing
2.	Summarize the following in detail: (i) UTRAN Interfaces, (ii) Transport Network Control plane, (iii) Transport Network User plane.	(5) (3) (5)	BTL 2 Understanding
3.	Illustrate the following UMTS core network architecture: (i) 3G – MSC, (ii) 3G – SGSN.	(6) (7)	BTL 3 Applying
4.	(i) Analyze the three different techniques in HSPDA. (ii) Examine the objectives and operational principles of HSDPA.	(6) (7)	BTL 4 Analyzing
5.	(i) Describe the channels introduced in HSDPA. (ii) Define the responsibility of user equipment in HSDPA.	(10) (3)	BTL 1 Remembering
6.	Discuss in detail about the overview and system architecture of CDMA 2000.	(13)	BTL 2 Understanding
7.	Write short notes on: (i) 1X EV-DO REV A, (ii) 1X EV-DO REV B.	(6) (7)	BTL 1 Remembering
8.	Manipulate the 1X EV-DO REV C (UMB) and other prominent features and explain.	(13)	BTL 3 Applying
9.	Describe the following in detail: (i) Packet Data Serving Node (PSDN) in CDMA 2000, (ii) Base Transceiver Station (BTS).	(6) (7)	BTL 2 Understanding
10.	Examine the Network structure of CDMA 2000 and its three main variants.	(13)	BTL 3 Applying
11.	(i) Outline the various platform and its descriptions in CDMA 2000. (ii) Write about the enhancements of CDMA 2000 over existing IS-95.	(10) (3)	BTL 1 Remembering
12.	Draw the forward CDMA channel and write about its modulation schemes.	(13)	BTL 1 Remembering
13.	Formulate the data rates and characteristics for Forward link RC and SR and Reverse link RC and SR.	(13)	BTL 6 Creating
14.	Evaluate the architecture of Generic TD-SCDMA network.	(13)	BTL 5 Evaluating
<b>Part – C</b>			
1.	Explain the Radio Access Network Application Protocol and its	(15)	BTL 5 Evaluating

	functions.			
2.	Evaluate 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)	BTL 5	Evaluating
3.	Generalize the fundamental architecture of a Time Division Code Division Multiple Access (TD-CDMA) and core network.	(15)	BTL 6	Creating
4.	Develop the core network associated with TD-SCDMA wireless network for Release 5.	(15)	BTL 6	Creating

#### 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	BTL	Competence
1.	List the internetworking requirements.	BTL 1	Remembering
2.	Categorize the internetworking schemes.	BTL 4	Analyzing
3.	Formulate the gateway approach to internetwork WLANs and 3G networks.	BTL 6	Creating
4.	Sketch the architecture of emulator approach.	BTL 2	Understanding
5.	Define session.	BTL 1	Remembering
6.	Name the generic approaches of internetworking.	BTL 1	Remembering
7.	Examine the trend followed in loose coupling.	BTL 4	Analyzing
8.	Write the functions of tight coupling in internetworking.	BTL 1	Remembering
9.	Devise the tight coupling architecture between WLAN and GPRS.	BTL 6	Creating
10.	Outline the main function of GIF.	BTL 2	Understanding
11.	How system mobility is achieved?	BTL 1	Remembering
12.	Illustrate the implementation of the interfaces related to the mobile station.	BTL 3	Applying
13.	Mention the attributes of QoS in the uplink direction.	BTL 2	Understanding
14.	Interpret the significance of $W_f$ interface.	BTL 3	Applying
15.	Summarize the features of LMDS.	BTL 2	Understanding



16.	Explore the term multipoint in Local Multipoint Distribution Service.		BTL 5	Evaluating
17.	Give the advantages of LMDS for broadband.		BTL 1	Remembering
18.	Classify the present IEEE 802.16 standards.		BTL 3	Applying
19.	Assess the purpose of MMDS.		BTL 5	Evaluating
20.	Analyze the access schemes used in multichannel multipoint distribution system.		BTL 4	Analyzing
<b>Part - B</b>				
1.	What are the objectives and the requirements for interworking between a wireless wide area network (WWAN) and a wireless local area network (WLAN)?	(13)	BTL 1	Remembering
2.	Draw the different architectures to connect WLANs and 3G Networks.	(13)	BTL 1	Remembering
3.	(i) Explain about the tight coupling architecture in detail.	(5)	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)	BTL 3	Applying
	(ii) Elaborate the approaches for transporting the GPRS signalling and user data.	(6)		
5.	Outline the WLAN adaptation function (WAF) in tight coupling architecture and explain with an appropriate diagram.	(13)	BTL 2	Understanding
6.	Enumerate the GPRS interworking function (GIF)/routing area update (RAU) discovery procedure in tight coupling architecture.	(13)	BTL 5	Evaluating
7.	Analyze the integration of IEEE 802.11 WLAN and GPRS using loose coupling.	(13)	BTL 4	Analyzing
8.	(i) Brief the WLAN system architecture reusing the 3GPP subscription.	(6)	BTL 2	Understanding
	(ii) How is authentication achieved in loose coupling architecture?	(7)		
9.	Examine the SIM based authentication over WLAN.	(13)	BTL 1	Remembering
10.	Compare tight and loose coupling architecture for interworking between IEEE 802.11 WLAN and GPRS.	(13)	BTL 4	Analyzing
11.	Formulate the operating principle of local multipoint distribution system.	(13)	BTL 6	Creating
12.	(i) Write the significant features of LMDS.	(6)	BTL 1	Remembering
	(ii) With an example explain the LMDS configuration.	(7)		

13.	(i)	Illustrate the MMDS system for digital video and wireless internet.	(8)	BTL 2	Understanding
	(ii)	Summarize the functional operation of MMDS.	(5)		
14.	Examine the multichannel multipoint distribution system (MMDS). Distinguish it with LMDS.		(13)	BTL 4	Analyzing
Part – C					
1.	Formulate the tight coupling system configuration of WLAN-GPRS.		(15)	BTL 6	Creating
2.	(i)	Generalize the features of WLAN coupling points using the GPRS reference diagram.	(8)	BTL 6	Creating
	(ii)	Devise a system description for a tight coupling in a internetworking between WLAN and GPRS.	(7)		
3.	Determine the different types of interface between WLAN and the GPRS.		(15)	BTL 5	Evaluating
4.	(i)	Assess the different modulation schemes adopted in LMDS	(5)	BTL 5	Evaluating
	(ii)	Evaluate the components of the LMDS architecture	(10)		

## 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	BTL	Competence
1.	Write about 4G network.	BTL 1	Remembering
2.	How the vision of 4G system is stated?	BTL 1	Remembering
3.	Mention the features and challenges of 4G.	BTL 2	Understanding
4.	Is it possible to get 4G services on the 3G phone? Justify your answer.	BTL 5	Evaluating
5.	Which are all the technologies that can be applied in 4G services.	BTL 3	Applying
6.	Formulate the techniques to improve network survivability in different layers and name the challenges faced by 4G.	BTL 6	Creating
7.	State the design challenges of 4G system.	BTL 1	Remembering
8.	Outline the new developments in 4G.	BTL 2	Understanding
9.	Assess the challenges of 4G on system and service.	BTL 5	Evaluating
10.	Interpret the applications of 4G.	BTL 3	Applying

11.	Define Multicarrier modulation		BTL 1	Remembering
12.	Enumerate the term receiver diversity.		BTL 6	Creating
13.	List the advantages of multi carrier modulation over single carrier modulation schemes.		BTL 1	Remembering
14.	Classify the smart antenna techniques based on the number of transmitting and receiving antennas.		BTL 4	Analyzing
15.	Express the channel capacity of a MIMO system with M transmitting antennas and N receiving antennas.		BTL 3	Applying
16.	Summarize the features of IP Multimedia Subsystem.		BTL 2	Understanding
17.	Categorize the layers of IMS architecture.		BTL 4	Analyzing
18.	What are the key requirements of LTE?		BTL 1	Remembering
19.	Illustrate the issues in terminal mobility.		BTL 2	Understanding
20.	Analyze the working principle of MVNO.		BTL 4	Analyzing
<b>Part - B</b>				
1.	What the 4G key challenges and mention the proposed solutions.	(13)	BTL 1	Remembering
2.	(i) Write short notes about the evolution of 4G system.	(6)	BTL 1	Remembering
	(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)	BTL 3	Applying
	(ii) Illustrate the 4G vision with appropriate diagram.	(5)		
4.	Summarize the integration of 4G wireless technologies.	(13)	BTL 2	Understanding
5.	(i) Compare the performance of MC-CDMA with OFDM-TDMA.	(8)	BTL 1	Remembering
	(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)	BTL 1	Remembering
7.	Assess the smart antenna techniques and explain in detail.	(13)	BTL 5	Evaluating
8.	(i) Outline the features of IMS components.	(5)	BTL 2	Understanding
	(ii) Explain the service architecture and its entities of IMS.	(8)		
9.	Formulate the structure and compare the different smart antenna techniques used for wireless communication systems.	(13)	BTL 6	Creating
10.	Explain end to end architecture of LTE network.	(13)	BTL 2	Understanding
11.	Categorize the channels available in LTE network, explain	(13)	BTL 4	Analyzing

	each category elaborately.				
12.	Analyze the functions and architecture of BWA.		(13)	BTL 4	Analyzing
13.	(i)	Elaborate the stix agent architecture.	(7)	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)	BTL 4	Analyzing
Part – C					
1.	Evaluate the technologies behind the 4G services and explain in detail.		(15)	BTL 5	Evaluating
2.	Determine the multicarrier modulation scheme adopted in 4G system, explain the working procedure of the scheme with necessary diagram.		(15)	BTL 6	Creating
3.	(i)	Interpret the user plane end-to-end protocol stack based on the protocol architecture of LTE.	(7)	BTL 5	Evaluating
	(ii)	Assess the Local services offered in LTE system	(8)		
4.	Estimate the effective distributed system as a management goal in broadband wireless access.		(15)	BTL 6	Creating