SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

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DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

V SEMESTER

PEC602 – WIRELESS BROADBAND NETWORKS

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

QUESTION BANK

SUBJECT : PEC602 Wireless Broadband Networks

SEM / YEAR: V / III Year

UNIT-I: WIRELESS PROTOCOLS
Mobile network layer – Fundamentals of Mobile IP – Data forwarding procedures in mobile IP – IP mobility management, IP addressing- DHCP, Mobile transport layer- Traditional TCP- Congestion control- Slow start, fast recovery/fast retransmission- Classical TCP improvements- Indirect TCP, snooping TCP, Mobile TCP.

Part – A				
Q. No	Questions	CO	BTL	Competence
1.	Define Mobile IP.	CO1	BTL 1	Remembering
2.	What are the key elements of Mobile IP architecture?	CO1	BTL 2	Understanding
3.	List the types of IP addresses used in Mobile IP.	CO1	BTL 1	Remembering
4.	What is the role of DHCP in mobile networks?	CO1	BTL 2	Understanding
5.	Differentiate between home agent and foreign agent.	CO1	BTL 2	Understanding
6.	Define IP mobility.	CO1	BTL 1	Remembering
7.	What is tunneling in Mobile IP?	CO1	BTL 2	Understanding
8.	Explain the concept of triangle routing.	CO1	BTL 2	Understanding
9.	State the purpose of mobile transport layer.	CO1	BTL 1	Remembering
10.	List the limitations of traditional TCP in mobile networks.	CO1	BTL 1	Remembering
11.	Define congestion control in TCP.	CO1	BTL 1	Remembering
12.	What is slow start mechanism in TCP?	CO1	BTL 2	Understanding
13.	Explain fast retransmission in TCP.	CO1	BTL 2	Understanding
14.	Explain fast recovery technique.	CO1	BTL 2	Understanding
15.	What are the classical TCP improvements?	CO1	BTL 2	Understanding
16.	Differentiate between Indirect TCP and Mobile TCP.	CO1	BTL 2	Understanding
17.	What is snooping TCP?	CO1	BTL 1	Remembering
18.	Define foreign agent care-of address.	CO1	BTL 1	Remembering
19.	What is the use of agent discovery messages?	CO1	BTL 2	Understanding
20.	Explain IP-in-IP encapsulation.	CO1	BTL 2	Understanding
21.	What are the main goals of TCP enhancements for wireless?	CO1	BTL 2	Understanding

22.	Describe soft handoff in mobile IP.		CO1	BTL 2	Understanding
23.	List the challenges in mobile IP communication.		CO1	BTL 1	Remembering
24.	What is the use of registration messages in Mobile IP?		CO1	BTL 2	Understanding
Part – B					
1.	(i) Describe the working of Mobile IP with a neat diagram.	(8)	CO1	BTL 3	Applying
	(ii) Explain the fundamentals of Mobile IP with neat diagrams.	(8)	CO1	BTL 3	Applying
2.	(i) Analyze the IP mobility management process in Mobile IP.	(8)	CO1	BTL 4	Analyzing
	(ii) Differentiate between slow start and congestion avoidance in TCP. Why are both needed in wireless networks?	(8)	CO1	BTL 4	Analyzing
3.	Explain the data forwarding procedure in Mobile IP.	(16)	CO1	BTL 3	Applying
4.	Compare the performance of traditional TCP and Mobile TCP in wireless networks.	(16)	CO1	BTL 4	Analyzing
5.	Illustrate slow start and fast recovery with an example.	(16)	CO1	BTL 3	Applying
6.	Explain congestion control techniques in a mobile network scenario.	(16)	CO1	BTL 3	Applying
7.	Distinguish between Indirect TCP and Snooping TCP.	(16)	CO1	BTL 4	Analyzing
8.	(i) Explain the significance of DHCP in mobile addressing.	(8)	CO1	BTL 3	Applying
	(ii) Discuss the role of DHCP in mobile networks.	(8)	CO1	BTL 3	Applying
9.	Analyze the problems faced by traditional TCP over wireless networks.	(16)	CO1	BTL 4	Analyzing
10.	Describe enhancements made in classical TCP to improve mobility support.	(16)	CO1	BTL 3	Applying
11.	Compare tunneling and encapsulation techniques in Mobile IP.	(16)	CO1	BTL 4	Analyzing
12.	Describe in detail about agent discovery and registration in real-time mobility.	(16)	CO1	BTL 3	Applying
13.	Examine fast retransmission in the context of packet loss.	(16)	CO1	BTL 4	Analyzing
14.	Explain triangle routing and suggest solutions to minimize it.	(16)	CO1	BTL 3	Applying
15.	Discuss challenges of TCP in high-latency mobile environments.	(16)	CO1	BTL 4	Analyzing
16.	Explain snooping TCP mechanism in wireless LAN environment.	(16)	CO1	BTL 3	Applying
17.	Evaluate the role of mobility agents in IP mobility management. How do they assist during handoffs and registration?	(16)	CO1	BTL 4	Analyzing

UNIT-II: 3G EVOLUTION

IMT-2000 - W-CDMA, CDMA 2000- Radio & network components- Network structure- Packet-data transport process flow- Channel Allocation- core network, interference- Mitigation techniques- UMS- Services, air interference – Network architecture of 3GPP- UTRAN architecture- High Speed Packet Data- HSDPA,HSUPA.

Part – A

Q. No	Questions	CO	BTL	Competence
1.	What is IMT 2000 ?	CO2	BTL 1	Remembering
2.	What is W-CDMA ?	CO2	BTL 1	Remembering
3.	Mention the types of transport channels in W-CDMA.	CO2	BTL 1	Remembering
4.	Name the control channels of W-CDMA.	CO2	BTL 1	Remembering
5.	What is meant by DTCH & CTCH ?	CO2	BTL 1	Remembering
6.	What is CDMA 2000 ?	CO2	BTL 1	Remembering
7.	Mention the applications of 3G.	CO2	BTL 2	Understanding
8.	What are the different platforms of CDMA 2000 ?	CO2	BTL 1	Remembering
9.	Define BSC.	CO2	BTL 1	Remembering
10.	Define MSC.	CO2	BTL 1	Remembering
11.	List the three main variants of a CDMA 2000 network.	CO2	BTL 1	Remembering
12.	How the basis of selection of variants can be done in CDMA 2000.	CO2	BTL 2	Understanding
13.	Mention the packet data service states of CDMA 2000.	CO2	BTL 2	Understanding
14.	Expand the terms SGSN & GGSN.	CO2	BTL 2	Understanding
15.	What are the service classes of UMTS.	CO2	BTL 2	Understanding
16.	What is SIP.	CO2	BTL 1	Remembering
17.	What is an UTRAN ?	CO2	BTL 1	Remembering
18.	List the key features of HSPA.	CO2	BTL 1	Remembering
19.	What do you understand by USIM ?	CO2	BTL 2	Understanding
20.	Infer about UMTS.	CO2	BTL 2	Understanding
21.	Define HLR.	CO2	BTL 2	Understanding
22.	Mention the techniques used in HSPA.	CO2	BTL 1	Remembering
23.	Differentiate between HSDPA & HSUPA	CO2	BTL 2	Understanding
24.	List any four general specifications for the IMT 2000.	CO2	BTL 1	Remembering

Part – B

	Questions		CO	BTL	Competence
1	(i) Explain the architecture of W-CDMA with a suitable diagram.	(8)	CO2	BTL 3	Applying
	(ii) Illustrate the architecture of IMT-2000 highlighting the differences between W-CDMA and CDMA2000 in terms of radio and network components.	(8)	CO2	BTL 3	Applying
2	Analyze the working of CDMA2000 and compare it with W-CDMA.	(16)	CO2	BTL 4	Analyzing
3	Explain the concept of UTRAN to a real-time 3G scenario.	(16)	CO2	BTL 3	Applying
4	Distinguish between packet data flows in W-CDMA and CDMA2000 networks.	(16)	CO2	BTL 4	Analyzing

5	Describe the air interface components and their function in 3G.	(16)	CO2	BTL 3	Applying
6	Analyze how HSDPA improves downlink data rates in 3G networks.	(16)	CO2	BTL 4	Analyzing
7	Explain the uplink enhancement features of HSUPA with examples.	(16)	CO2	BTL 3	Applying
8	Compare the core network structures of W-CDMA and CDMA2000.	(16)	CO2	BTL 4	Analyzing
9	Describe in detail about the channelization techniques to reduce interference in 3G systems.	(16)	CO2	BTL 3	Applying
10	Examine the differences in QoS between CDMA2000 and W-CDMA.	(16)	CO2	BTL 4	Analyzing
11	Demonstrate the flow of packet data in a 3G UTRAN-based network.	(16)	CO2	BTL 3	Applying
12	Analyze the role of UMS in 3G service delivery.	(16)	CO2	BTL 4	Analyzing
13	Discuss how 3G architectures support multimedia services.	(16)	CO2	BTL 3	Applying
14	(i) Compare the 3GPP and 3GPP2 approaches to network evolution.	(6)	CO2	BTL 4	Analyzing
	(ii) Evaluate how interference mitigation techniques help maintain QoS in dense urban 3G networks.	(10)	CO2	BTL 4	Analyzing
15	Illustrate how 3G systems handle air interface interference.	(16)	CO2	BTL 3	Applying
16	Analyze the key challenges in implementing UTRAN in dense environments.	(16)	CO2	BTL 4	Analyzing
17	(i) Examine the architecture and packet flow differences in HSDPA and HSUPA.	(7)	CO2	BTL 4	Analyzing
	(ii) Evaluate how interference mitigation techniques help maintain QoS in dense urban 3G networks.	(9)	CO2	BTL 4	Analyzing

UNIT-III: 4G EVOLUTION

Introduction to LTE-A – Requirements and Challenges, network architectures- EPC, E- UTRAN architecture-Mobility management, resource management, services, channel- Logical and transport channel mapping-Downlink/uplink data transfer MAC control element- PDU packet formats- Scheduling services, random access procedure.

Part – A

Q. No	Questions	CO	BTL	Competence
1.	What is LTE-Advanced?	CO3	BTL 1	Remembering
2.	Define EPC in LTE architecture.	CO3	BTL 1	Remembering
3.	What are the key requirements of LTE-A?	CO3	BTL 2	Understanding
4.	Explain the challenges in LTE-A deployment.	CO3	BTL 2	Understanding
5.	List the main components of E-UTRAN.	CO3	BTL 1	Remembering
6.	Define mobility management in LTE-A.	CO3	BTL 1	Remembering
7.	What are logical channels in LTE?	CO3	BTL 1	Remembering
8.	Explain transport channel mapping in LTE.	CO3	BTL 2	Understanding
9.	What is MAC control element?	CO3	BTL 1	Remembering
10.	Describe scheduling services in LTE.	CO3	BTL 2	Understanding
11.	What is random access procedure in LTE-A?	CO3	BTL 2	Understanding
12.	Define uplink and downlink in LTE networks.	CO3	BTL 1	Remembering
13.	What are the functions of the EPC?	CO3	BTL 2	Understanding
14.	What is a PDU in LTE architecture?	CO3	BTL 1	Remembering
15.	Explain the purpose of MAC layer in LTE.	CO3	BTL 2	Understanding
16.	What are the types of services offered by LTE-A?	CO3	BTL 1	Remembering

17.	Describe the architecture of E-UTRAN.	CO3	BTL 2	Understanding
18.	What are resource management functions in LTE-A?	CO3	BTL 2	Understanding
19.	List the logical and transport channels used in LTE.	CO3	BTL 1	Remembering
20.	Explain the function of MAC control element.	CO3	BTL 2	Understanding
21.	What is the function of scheduling in LTE networks?	CO3	BTL 2	Understanding
22.	Define downlink data transfer in LTE.	CO3	BTL 1	Remembering
23.	Define uplink data transfer in LTE.	CO3	BTL 1	Remembering
24.	Describe the format of PDU packets.	CO3	BTL 2	Understanding

Part – B				
1.	Illustrate the architecture of LTE-A with emphasis on EPC and E-UTRAN components. Explain their functional roles.	(16)	CO3	BTL 3	Applying
2.	Analyze the role of EPC in LTE-A architecture.	(16)	CO3	BTL 4	Analyzing
3.	Explain logical and transport channel mapping for a specific LTE service.	(16)	CO3	BTL 3	Applying
4.	Analyze challenges faced in LTE-A deployment in urban areas.	(16)	CO3	BTL 4	Analyzing
5.	Illustrate the MAC control element function with an example.	(16)	CO3	BTL 3	Applying
6.	Examine how scheduling services affect network performance in LTE.	(16)	CO3	BTL 4	Analyzing
7.	Demonstrate the random access procedure in LTE-A.	(16)	CO3	BTL 3	Applying
8.	Analyze mobility management in LTE under different user scenarios.	(16)	CO3	BTL 4	Analyzing
9.	Explain the resource management techniques to enhance LTE performance.	(16)	CO3	BTL 3	Applying
10.	Compare uplink and downlink data transfers in LTE with examples.	(16)	CO3	BTL 4	Analyzing
11.	(i) Examine the PDU packet format used in LTE-A.	(8)	CO3	BTL 4	Analyzing
	(ii) Apply MAC control elements to design a PDU packet format for a given communication scenario.	(8)	CO3	BTL 4	Analyzing
12.	(i) Implement logical channel configurations in a simulated LTE environment.	(8)	CO3	BTL 3	Applying
	(ii) Describe in detail about logical and transport channel structures to describe a full data transmission cycle in LTE.	(8)	CO3	BTL 3	Applying
13.	Evaluate the impact of MAC scheduling on LTE QoS parameters.	(16)	CO3	BTL 4	Analyzing
14.	Illustrate end-to-end data flow through E-UTRAN and EPC.	(16)	CO3	BTL 3	Applying
15.	(i) Compare LTE-A network architecture with previous 3G systems.	(8)	CO3	BTL 4	Analyzing
	(ii) Analyze how LTE-A overcomes latency issues using advanced scheduling and resource management.	(8)	CO3	BTL 4	Analyzing
16.	Apply LTE-A principles to design a network for a smart city scenario.	(16)	CO3	BTL 3	Applying
17.	Analyze the effectiveness of scheduling algorithms in uplink channels.	(16)	CO3	BTL 4	Analyzing

UNIT-IV: LAYER-LEVEL FUNCTIONS

Characteristics of wireless channels- Downlink physical layer, uplink physical layer, MAC scheme- Frame structure, resource structure, Mapping- synchronization, reference signals and channel estimation- SC-FDMA, interference cancellation – CoMP, Carrier aggregation.

Q. No	Questions	CO	BTL	Competence
1.	Name the IEs use when creating a UL map message.	CO4	BTL 1	Remembering
2.	What are the 3 types of sub carriers?	CO4	BTL 1	Remembering
3.	Draw the frame structure type-II	CO4	BTL 1	Remembering
4.	Define the function of PDCCH.	CO4	BTL 1	Remembering
5.	Name the synchronization signals defined in E-UTRA.	CO4	BTL 1	Remembering
6.	List any three reference models.	CO4	BTL 1	Remembering
7.	What is meant by interference cancellation?	CO4	BTL 2	Understanding
8.	List the interference cancellation models.	CO4	BTL 1	Remembering
9.	What is the main objective of CoMP?	CO4	BTL 1	Remembering
10.	How are the CoMP transmit & receive techniques classified?	CO4	BTL 1	Remembering
11.	What are the transmitter requirements for carrier aggregation?	CO4	BTL 1	Remembering
12.	State carrier aggregation.	CO4	BTL 2	Understanding
13.	What are the major UE attributes for transmitter carrier aggregation?	CO4	BTL 2	Understanding
14.	What are the major eNB attributes for transmitter carrier aggregation?	CO4	BTL 1	Remembering
15.	What are the receiver requirements for carrier aggregation?	CO4	BTL 1	Remembering
16.	What are the major UE attributes for receiver carrier aggregation?	CO4	BTL 1	Remembering
17.	What are the major eNB attributes for receiver carrier aggregation?	CO4	BTL 1	Remembering
18.	Express the received signal power of an isotropic antenna.	CO4	BTL 2	Understanding
19.	Expand SSTG.	CO4	BTL 2	Understanding
20.	How many subframes are available in a 10ms radio frame?	CO4	BTL 1	Remembering
21.	Define VRB.	CO4	BTL 1	Remembering
22.	When are the synchronization signals transmitted in a radio frame?	CO4	BTL 2	Understanding
23.	Write the equation for the channel transfer function at the pk^{th} pilot sub	CO4	BTL 2	Understanding
24.	State the principle of SC – FDMA.	CO4	BTL 2	Understanding
	Part – B			
1.	Explain in detail about downlink physical layer processing in LTE-advanced. (16)	CO4	BTL 4	Applying
2.	Describe resource structure mapping and explain the physical resource structure and channel mapping with diagrams. (16)	CO4	BTL 4	Applying
3.	How the resource block structure can be explained in time and frequency dimensions. Explain in detail. (16)	CO4	BTL 4	Applying
4.	(i) Describe the characteristics of wireless channels with necessary equations. (8)	CO4	BTL 3	Analyzing
	(ii) Analyze the concepts of the uplink physical layer with neat diagrams. (8)	CO4	BTL 3	Analyzing

Q. No	Questions	Marks	CO	BTL	Competence
5.	Explain the concepts of synchronization and the synchronization signals defined in E-UTRA.	(16)	CO4	BTL 4	Applying
6.	(i) Discuss about frame structure type-I with necessary diagrams.	(8)	CO4	BTL 3	Applying
	(ii) Examine the concepts of frame structure type-II with neat diagrams.	(8)	CO4	BTL 3	Applying
7.	Define multiple access scheme and explain SC-FDMA principles with necessary illustrations..	(16)	CO4	BTL 3	Analyzing
8.	Illustrate the interference models and cancellation at the symbol and codeword level.	(16)	CO4	BTL 4	Applying
9.	Evaluate the use of CoMP in enhancing high data rate services. How does it affect interference and coordination?	(16)	CO4	BTL 3	Analyzing
10.	Illustrate the CoMP transmission & reception techniques.	(16)	CO4	BTL 4	Applying
11.	Demonstrate the concepts of location and structure of primary and secondary synchronization signals.	(16)	CO4	BTL 3	Analyzing
12.	Explain the secondary synchronization and its signal generation and mapping.	(7)	CO4	BTL 4	Applying
13.	Sketch the enhanced PDCCH structure and explain in detail.	(16)	CO4	BTL 3	Analyzing
14.	Compare & contrast static and dynamic CoMP clusters with neat diagrams.	(16)	CO4	BTL 4	Applying
15.	Illustrate downlink CB/CS and JT CoMP concepts with necessary diagrams.	(16)	CO4	BTL 3	Analyzing
16.	Explain the architecture of a distributed antenna system with one-tier interference model.	(16)	CO4	BTL 4	Applying
17.	(i) Describe the concepts of transmitter requirements for carrier aggregation.	(8)	CO4	BTL 3	Analyzing
	(ii) Describe in detail about receiver requirements for carrier aggregation.	(8)	CO4	BTL 3	Analyzing

UNIT-V: 5G EVOLUTION

5G Roadmap - Pillars of 5G - 5G Architecture, The 5G internet - IoT and context awareness - Networking reconfiguration and virtualization support - Mobility QoS control - Emerging approach for resource over provisioning, Small cells for 5G mobile networks- - Mobile data demand, challenges, conclusion and future directions.

Q. No	Questions	CO	BTL	Competence
1.	Define 5G.	CO5	BTL 1	Remembering
2.	What are the key features of 5G technology?	CO5	BTL 1	Remembering
3.	List the frequency bands used in 5G.	CO5	BTL 1	Remembering
4.	Define Enhanced Mobile Broadband (eMBB).	CO5	BTL 1	Remembering
5.	What is Ultra Reliable Low Latency Communication (URLLC)?	CO5	BTL 1	Remembering
6.	Define Massive Machine Type Communication (mMTC).	CO5	BTL 1	Remembering
7.	Explain the role of network slicing in 5G.	CO5	BTL 2	Understanding
8.	Define beamforming in 5G.	CO5	BTL 1	Remembering
9.	What is the function of 5G NR (New Radio)?	CO5	BTL 2	Understanding
10.	What are the challenges in implementing mmWave communication?	CO5	BTL 2	Understanding
11.	Differentiate between 4G and 5G networks.	CO5	BTL 2	Understanding
12.	What is the role of small cells in 5G?	CO6	BTL 2	Understanding

13.	Define the term latency in 5G context.	CO6	BTL 1	Remembering
14.	List the 5G deployment models.	CO6	BTL 1	Remembering
15.	Interpret the use of massive MIMO in 5G?	CO6	BTL 2	Understanding
16.	Explain edge computing in the context of 5G.	CO6	BTL 2	Understanding
17.	What is the function of SDN in 5G networks?	CO6	BTL 2	Understanding
18.	State the need for 5G over 4G.	CO6	BTL 1	Remembering
19.	Define 5G core network.	CO6	BTL 1	Remembering
20.	What is MEC (Multi-access Edge Computing)?	CO6	BTL 1	Remembering
21.	List the applications enabled by 5G.	CO6	BTL 1	Remembering
22.	Define spectrum sharing in 5G.	CO6	BTL 1	Remembering
23.	What is the role of AI in 5G network management?	CO6	BTL 2	Understanding
24.	List the goals of 5G evolution.	CO6	BTL 1	Remembering

Part – B

1.	(i) Explain the architecture and working of 5G NR.	(8)	CO5	BTL 3	Applying
	(ii) Analyze the three main pillars of 5G and discuss their role in enabling next-generation communication.	(8)	CO5	BTL 3	Applying
2.	Compare and analyze the three main 5G service categories: eMBB, URLLC, mMTC.	(16)	CO5	BTL 4	Analyzing
3.	Define and explain the concept of network slicing to different industry use-cases.	(16)	CO5	BTL 3	Applying
4.	Analyze the impact of mmWave frequency bands on 5G coverage and performance.	(16)	CO5	BTL 4	Analyzing
5.	Describe the role of beamforming in enhancing 5G performance.	(16)	CO5	BTL 3	Applying
6.	Examine the integration of SDN and NFV in 5G network management.	(16)	CO5	BTL 4	Analyzing
7.	Illustrate the benefits of massive MIMO in 5G with an example.	(16)	CO5	BTL 3	Applying
8.	(i) Compare 5G and 4G in terms of latency, speed, and architecture.	(6)	CO5	BTL 4	Analyzing
	(ii) Apply the concept of 5G internet to support real-time applications like AR/VR or remote surgery.	(10)	CO5	BTL 4	Analyzing
9.	Explain in detail about edge computing to improve real-time application performance in 5G.	(16)	CO6	BTL 3	Applying
10.	Analyze challenges in deployment of small cells in dense urban areas.	(16)	CO6	BTL 4	Analyzing
11.	Demonstrate how AI can be used for 5G resource optimization.	(16)	CO6	BTL 3	Applying
12.	Examine the role of 5G in enabling autonomous vehicle communication.	(16)	CO6	BTL 4	Analyzing
13.	Describe about spectrum sharing techniques in dynamic 5G environments.	(16)	CO6	BTL 3	Applying
14.	Analyze the limitations of existing LTE systems addressed by 5G.	(16)	CO6	BTL 4	Analyzing
15.	Illustrate with an example how network slicing supports diverse services.	(16)	CO6	BTL 3	Applying
16.	(i) Evaluate the performance of 5G in industrial IoT scenarios.	(8)	CO6	BTL 4	Analyzing
	(ii) Analyze current limitations of 5G and outline future directions toward 6G and AI-driven networks.	(8)	CO6	BTL 4	Analyzing
17.	Apply 5G concepts in designing a smart city communication infrastructure.	(16)	CO6	BTL 3	Applying