



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## ELECTRONICS AND COMMUNICATION ENGINEERING

### TUTORIAL QUESTION BANK

<b>Course Title</b>	Wireless LANS AND PANS				
<b>Course Code</b>	BESB03				
<b>Programme</b>	M. Tech				
<b>Semester</b>	I	ES			
<b>Course Type</b>	Professional Elective				
<b>Regulation</b>	IARE - R18				
<b>Course Structure</b>	<b>Theory</b>			<b>Practical</b>	
	<b>Lectures</b>	<b>Tutorials</b>	<b>Credits</b>	<b>Laboratory</b>	<b>Credits</b>
	3	-	3	-	-
<b>Chief Coordinator</b>	Ms. C Devisupraja, Assistant Professor, ECE				
<b>Course Faculty</b>	Ms. C Devisupraja, Assistant Professor, ECE				

### COURSE OBJECTIVES

I	Learn about First and Second Generation Cellular Systems, Cellular Communications from 1G to 3G, Wireless 4G systems.
II	Understand about importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies infrared technology, UHF narrowband technology, Spread Spectrum technology.
III	Learn about Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem and Reliability.

### COURSE OUTCOMES (COs):

CO 1	Describe first and second generation cellular systems and analyze cellular communications from 1G to 3G.
CO 2	Demonstrate network architecture and MAC layer issues and describe the importance of MAC layer applications.
CO 3	Demonstrate network architecture and MAC layer issues and describe the importance of MAC layer applications.
CO 4	Explore Bluetooth technology and its specifications, and describe the importance of wireless private area networks.
CO 5	Develop practical skills in use of ZigBee components and network topologies.

**COURSE LEARNING OUTCOMES (CLOs):****Students, who complete the course, will have demonstrated the ability to do the following:**

BESB03.01	Understand and Analyze First and Second Generation Cellular Systems with architectures.
BESB03.02	Analyze cellular Communications from 1G to 3G with architectures of AMPs,GSM and GPRS.
BESB03.03	Explain Wireless 4G systems & Wireless Spectrum of 4G with increased bandwidth and speed.
BESB03.04	Distinguish Random Access Methods of Pure ALOHA and Slotted ALOHA.
BESB03.05	Describe Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).
BESB03.06	Describe importance of Wireless LANs with components such as BSS,stations,ESS,Distributed systems
BESB03.07	Explain WLAN Topologies of infrastructure and adhoc mode of operations.
BESB03.08	Analyze Transmission Techniques and Distinguish wired and wireless LANs.
BESB03.09	Explain Network Architecture of IEEE 802.11 standard for wireless lans and Analyze MAC Layer issues.
BESB03.10	Describe importance of Wireless PANs and explain Bluetooth technology with Specifications and Enhancements.
BESB03.11	Explain Bluetooth interference issues, Traffic Engineering, QoS and Dynamics Slot Assignment.
BESB03.12	Describe IEEE 802.15.3 architecture.
BESB03.13	Understand ZigBee technology, components and network topologies.
BESB03.14	IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications.

## TUTORIAL QUESTION BANK

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
<b>UNIT-I</b>				
<b>WIRELESS SYSTEM&amp;RANDOM ACCESS PROTOCOLS</b>				
<b>Part - A(Short Answer Questions)</b>				
1	Define Bit rate.	Remember	CO 1	BESB03.01
2	List out the difference between bit rate and baud rate?	Remember	CO 1	BESB03.02
3	What are random access protocols?	Remember	CO 1	BESB03.04
4	Describe different types of controlled access protocols?	Understand	CO 1	BESB03.04
5	What the throughput is of ALOHA based on poison distribution?	Understand	CO 1	BESB03.04
6	Define slotted ALOHA.	Remember	CO 1	BESB03.04
7	List out the drawbacks of first and second generation cellular system?	Remember	CO 1	BESB03.01
8	Explain the wireless spectrum?	Understand	CO 1	BESB03.03
9	What is meant by ALOHA?	Understand	CO 1	BESB03.04
10	Write the needs of a random access protocols?	Understand	CO 1	BESB03.04
11	What is the data bandwidth for 4G network?	Remember	CO 1	BESB03.03
12	What are the specifications of a 4G cellular systems?	Remember	CO 1	BESB03.03
13	Define csma-ca and csma-cd.	Remember	CO 1	BESB03.04
14	Write in detail about GSM technology.	Remember	CO 1	BESB03.02
15	What is GPRS technology?	Remember	CO 1	BESB03.02
16	Differentiate between analog and digital cellular technology?	Understand	CO 1	BESB03.02
17	List out the standards used in 1G, 2G, 3G, 4G networks?	Understand	CO 1	BESB03.03
18	Mention the data bandwidth for 1G network?	Remember	CO 1	BESB03.01
19	Mention the data bandwidth for 2G & 2.5G network?	Understand	CO 1	BESB03.02
20	Mention the data Bandwidth for 3G network?	Understand	CO 1	BESB03.02
<b>Part - B (Long Answer Questions)</b>				
1	Discuss about the technical issues in wireless communication and explain the drawbacks of first and second generation cellular mobile communications.	Understand	CO 1	BESB03.01
2	Explain Slotted ALOHA in detail. Consider the Pure ALOHA, Slotted ALOHA and Non-persistent CSMA. Which one will you use at high load? Why?	Understand	CO 1	BESB03.04
3	Ten thousand airline stations are competing for the use of a single slotted ALOHA channel. The average station makes 18 requests/hour. A slot is 125 micro-sec. What is the approximate total channel load?	Understand	CO 1	BESB03.04
4	Sixteen stations, numbered 1 through 16, are contending for the use of a shared channel by using the adaptive tree walk protocol. If stations 2, 3, 5, 9, 12, 14 suddenly become ready at once, how many bit slots are needed to resolve the contention.	Understand	CO 1	BESB03.04

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
5	What is the performance techniques used in the design of CD protocol and also Show that the maximum efficiency of pure ALOHA is $1/ (2e)$	Remember	CO 1	BESB03.04
6	What is collision? How does carrier sense multiple access protocol/ collision detection protocol detect and handle collisions?	Understand	CO 1	BESB03.05
7	With the help of block diagram explain the operation of cellular systems and write a short notes on first, second, third and fourth generation of cellular mobile communications?	Understand	CO 1	BESB03.03
8	Explain in detail the operation of slotted ALOHA. Consider the delay of pure ALOHA versus slotted ALOHA at low load. Which one will provide less delay?	Remember	CO 1	BESB03.04
9	Assume CSMA/CD protocol. Find the minimum frame length for a 1Mbps bit rate and maximum network span of 10 kilometers with no repeaters. Assume a medium propagation delay of 4.5 nanoseconds per meter. Is CSMA/CD a reasonable protocol for a network of this span and bit rate?	Remember	CO 1	BESB03.04
10	Explain about ALOHA, CSMA, CSMA/CD and CSMA/CA protocols and compare their performances?	Remember	CO 1	BESB03.05
11	Explain in detail about GSM technology with neat block diagram?	Understand	CO 1	BESB03.02
12	Explain in detail about GPRS technology with neat block diagram?	Understand	CO 1	BESB03.02
13	Explain in detail about CSMA-CA/CSMA-CD with block diagrams and mention few differences?	Remember	CO 1	BESB03.05
14	Explain the structures of pure aloha and slotted aloha and differiente pure aloha and slotted aloha?	Remember	CO 1	BESB03.04
15	What are the performance techniques used in the design of collision detection protocol. Show that the best channel utilization with pure ALOHA is 18.4%?	Remember	CO 1	BESB03.04
16	What do you meant by carrier sense and collision detection? Explain in detail?	Understand	CO 1	BESB03.05
<b>Part - C (Analytical Questions)</b>				
1	Five thousand airline stations are competing for the use of a single slotted ALOHA channel. The average station makes 15 requests / hour. A slot is 100 micro-sec. What is the approximate total channel load?	Understand	CO 1	BESB03.04
2	Fifteen stations, numbered 1 through 15, are contending for the use of a shared channel by using the adaptive tree walk protocol. If stations 1, 3, 5, 7, 9, 13 suddenly become ready at once, how many bit slots are needed to resolve the contention?	Understand	CO 1	BESB03.04
3	Assume CSMA/CD protocol. Find the minimum frame length for a 2Mbps bit rate and maximum network span of 15 kilometers with no repeaters. Assume a medium propagation delay of 5 nanoseconds per meter. Is CSMA/CD a reasonable protocol for a network of this span and bit rate?	Understand	CO 1	BESB03.05
4	A large population of ALOHA users generates 50 request/sec. Time is slotted in units of 40msec. i. What is the chance of success on the first attempt? ii. What is the probability of exactly k collisions and then a success? iii. What is the expected number of transmission attempts are needed. iv. What is the channel load G?	Understand	CO 1	BESB03.04
5	How do 4G networks provide more speed than 3G networks? Why 3G mobile phone doesn't support 4G networks?	Understand	CO 1	BESB03.03

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
<b>UNIT - II</b>				
<b>WIRELESS LANS</b>				
<b>Part – A (Short Answer Questions)</b>				
1	What are the applications of Wireless LANs?	Remember	CO 2	BESB03.06
2	Classify wired media and wireless media?	Remember	CO 2	BESB03.06
3	Define direct sequence spread spectrum.	Remember	CO 2	BESB03.06
4	Compare and contrast the differences between fast and slow frequency hopping systems?	Understand	CO 2	BESB03.06
5	What are the security issues in wireless networks?	Understand	CO 2	BESB03.06
6	Define spread spectrum technology	Understand	CO 2	BESB03.07
7	List out the properties of pseudo noise code?	Understand	CO 2	BESB03.07
8	What are the applications of spread spectrum technology?	Remember	CO 2	BESB03.07
9	What is narrow band frequency? List out its applications?	Remember	CO 2	BESB03.07
10	What is ultra high frequency band? Discuss its applications?	Remember	CO 2	BESB03.07
11	What are WLAN topologies?	Understand	CO 2	BESB03.08
12	Define slotted persistent CSMA protocol.	Remember	CO 2	BESB03.08
13	What are the properties of Pseudo Noise sequence?	Remember	CO 2	BESB03.08
14	What are the limitations of WLAN technology?	Remember	CO 2	BESB03.08
15	What is meant by multiple accesses and multiplexing?	Understand	CO 2	BESB03.08
16	Define CSMA-CA protocol work?	Remember	CO 2	BESB03.08
17	What is meant by frequency hopping concept?	Remember	CO 2	BESB03.09
18	What is the importance of wireless LANS?	Remember	CO 2	BESB03.09
19	Explain about UHF narrow band technology?	Understand	CO 2	BESB03.09
20	Define direct sequence spread spectrum technique.	Remember	CO 2	BESB03.09
<b>Part - B (Long Answer Questions)</b>				
1	Classify wired media and wireless media and explain infrared, microwave and radio frequency systems corresponding to ISM bands?	Understand	CO 2	BESB03.06
2	List out the categories of digital wireless transmission techniques divided according to their applications. Explain each one of them briefly?	Understand	CO 2	BESB03.06
3	List out the specifications and applications of wireless LANs and explain the security issues in wireless networks?	Understand	CO 2	BESB03.06
4	List out the properties of Pseudo Noise sequence used in direct sequence spread spectrum technique?	Understand	CO 2	BESB03.06

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
5	Interpret the performance of direct sequence spread spectrum in noise and hammer. Discuss various demodulation techniques that are used in frequency hopped spread spectrum?	Remember	CO 2	BESB03.07
6	Interpret fast and slow frequency hopping spread spectrum technology with an example?	Understand	CO 2	BESB03.07
7	Discuss fast frequency hopping spread spectrum technology (FFHSS) with neat block diagram, and relate it with slow frequency spread spectrum technology (SFHSS)?	Understand	CO 2	BESB03.07
8	Generate pseudo noise sequence using four bit D-flipflop shift register and verify the balance property?	Understand	CO 2	BESB03.07
9	Classify narrowband technology and ultra high frequency narrow band technology with applications?	Remember	CO 2	BESB03.07
10	What are the drawbacks in analog communication system. Explain how the bandwidth is improved with the help of spread spectrum technology?	Understand	CO 2	BESB03.08
11	Explain the principle behind spread spectrum technique and how it is used to minimize interference in a CDMA system?	Understand	CO 2	BESB03.08
12	What are the issues that should be considered in deploying the WLAN's?	Remember	CO 2	BESB03.08
13	Explain in detail wireless local area network technologies, and list out the differences between them with neat architectures.	Understand	CO 2	BESB03.08
14	How pseudo random numbers are generated? Explain FHSS and DSSS / CDMA in detail?	Understand	CO 2	BESB03.08
15	Determine the throughput efficiency of the CDMA system?	Remember	CO 2	BESB03.08
<b>Part - C (Analytical Questions)</b>				
1	Consider a WLAN installation in which the maximum propagation delay is 0.4 sec. The WLAN operates at a data rate of 10 Mbps, and packets have 400 bits. Calculate the normalized throughput with i. An unslotted nonpersistent ii. A slotted persistent CSMA protocol	Remember	CO 2	BESB03.06
2	Consider a LAN with maximum distance of 2 km. at what bandwidth would the propagation delay is equal transmit delay for 100-byte packets? What about 512- byte packets?	Understand	CO 2	BESB03.06
3	Describe the direct sequence spread spectrum and frequency hopped spread spectrum techniques with neat block diagrams?	Remember	CO 2	BESB03.07
4	Explain the principle behind spread spectrum technique and how this is used to minimize interference in a CDMA system. Also determine the throughput efficiency of the system?	Remember	CO 2	BESB03.08
5	Consider a WLAN installation in which the maximum propagation delay is 0.8 sec. The WLAN operates at a data rate of 50 Mbps, and packets have 400 bits. Calculate the normalized throughput with i. An unslotted nonpersistent ii. A slotted persistent CSMA protocol	Remember	CO 2	BESB03.06
<b>UNIT-III</b>				
<b>THE IEEE 802.11 STANDARD FOR WIRELESS LANS</b>				
<b>Part - A (Short Answer Questions)</b>				
1	What is BSS mode in network topology?	Remember	CO 3	BESB03.09
2	What is ESS mode in network topology?	Remember	CO 3	BESB03.09

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
3	Illustrate the significance of physical layer?	Understand	CO 3	BESB03.09
4	What are the different sub layers present within the physical layer?	Remember	CO 3	BESB03.09
5	Write about design representation for the system level synthesis?	Understand	CO 3	BESB03.09
6	Define congestion.	Understand	CO 3	BESB03.09
7	Define MAC frame format.	Understand	CO 3	BESB03.09
8	List out the general principles of congestion control?	Understand	CO 3	BESB03.09
<b>CIE-II</b>				
9	What are the services offered by MAC layer?	Remember	CO 3	BESB03.09
10	Illustrate MAC layer challenges in wireless sensor network?	Remember	CO 3	BESB03.10
11	Discuss various MAC layer issues?	Remember	CO 3	BESB03.10
12	Define TDMA with its frame format.	Remember	CO 3	BESB03.10
13	What are the protocols used at MAC layer?	Understand	CO 3	BESB03.10
14	Write about slotted ALOHA protocols and CSMA protocols briefly?	Remember	CO 3	BESB03.10
15	What is hidden station problem?	Understand	CO 3	BESB03.11
16	Explain briefly about IEEE 802.11 standard?	Remember	CO 3	BESB03.11
17	Explain the structure of physical layer?	Remember	CO 3	BESB03.11
18	Write short notes on control field in MAC frames?	Understand	CO 3	BESB03.11
19	Explain wireless local area network technologies briefly?	Remember	CO 3	BESB03.11
20	How pseudo random numbers are generated?	Understand	CO 3	BESB03.11
<b>Part - B (Long Answer Questions)</b>				
1	Discuss how the channel allocation is done in IEEE802.11a Standard.	Remember	CO 3	BESB03.11
2	Discuss in detail about hidden terminal problem, reliability, collision avoidance and congestion avoidance corresponding to MAC layer.	Understand	CO 3	BESB03.09
3	What is the significance of physical layer? Explain the frame structure of physical layer?	Remember	CO 3	BESB03.09
4	Explain about hidden node issue problem specific to WLAN in MAC layer.	Remember	CO 3	BESB03.10
5	Explain briefly about pure ALOHA, slotted ALOHA and CSMA protocols and compare their performances in terms of throughput.	Understand	CO 3	BESB03.09
6	list out the steps involved in the technique for selecting the access points by the stations?	Understand	CO 3	BESB03.10
7	Write about PMD layers in IEEE 802.11 Infrared WLAN standard with neat diagrams.	Understand	CO 3	BESB03.11
8	What is meant by Congestion? List out the general principles of congestion control.	Understand	CO 3	BESB03.11

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
<b>CIE -II</b>				
9	Explain in detail about Hidden Terminal Problem?	Understand	CO 3	BESB03.10
10	Write about IEEE 802.11e MAC protocol	Understand	CO 3	BESB03.10
11	Discuss in detail about the Mac Layer Issues.	Understand	CO 3	BESB03.10
12	Compare and contrast the differences between IEEE 802.11A and IEEE 802.11B WLAN standards.	Understand	CO 3	BESB03.10
13	Describe the services offered by MAC layer of IEEE 802.11 wireless LAN	Understand	CO 3	BESB03.11
14	Classify the following which corresponds to 802.11 Mac sub layer Reliable data delivery Access control MAC frame format	Remember	CO 3	BESB03.11
15	Interpret IEEE 802.11 distributed coordination function (DCF) protocol with back-off mechanism with example?	Remember	CO 3	BESB03.11
<b>Part - C (Analytical Questions)</b>				
1	Explain the structure of interference scenarios between Bluetooth and IEEE 802.11 device.	Remember	CO 3	BESB03.11
2	Explain the network topologies of basic service set (BSS) mode and extended service set (ESS) mode with architectures.	Understand	CO 3	BESB03.09
<b>CIE-II</b>				
3	Discuss in detail about the hidden terminal problem and collision avoidance corresponding to MAC layer issues.	Remember	CO 3	BESB03.10
4	Briefly explain about WLAN Topologies and list out the differences between them.	Remember	CO 3	BESB03.11
5	Write about PLCP layers in IEEE 802.11 Infrared WLAN Standard with neat diagrams.	Understand	CO 3	BESB03.11
<b>UNIT-IV WIRELESS PANS</b>				
<b>Part - A (Short Answer Questions)</b>				
1	Justify the importance of Wireless PANS?	Understand	CO 4	BESB03.09
2	Discuss the applications of Bluetooth technology?	Remember	CO 4	BESB03.11
3	Differentiate between piconet and scatternet architecture?	Remember	CO 4	BESB03.10
4	List out the random access methods for mobile data services?	Remember	CO 4	BESB03.05
5	Explain the structure of protocol stack in Bluetooth?	Remember	CO 4	BESB03.11
6	Write about dynamic slot assignment?	Remember	CO 4	BESB03.10
7	Explain master slave switch?	Remember	CO 4	BESB03.10
8	Illustrate the scatter net formation?	Remember	CO 4	BESB03.11
9	Discuss about Bluetooth security	Understand	CO 4	BESB03.11
10	List out the issues involved in Bluetooth interference?	Understand	CO 4	BESB03.11



S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
11	Define Traffic engineering.	Remember	CO 4	BESB03.10
12	Explain in detail about the characteristics of Bluetooth technology?	Understand	CO 4	BESB03.11
13	Discuss about air interference in Bluetooth technology	Remember	CO 4	BESB03.11
14	Explain in detail about piconet and scatternet formation topologies	Understand	CO 4	BESB03.11
15	Define QOS.	Understand	CO 4	BESB03.11
16	Define Adhoc networking.	Remember	CO 4	BESB03.11
17	Write short notes on Bluetooth scatternet architecture	Understand	CO 4	BESB03.11
18	Difference between Wifi & Wimax technologies	Understand	CO 4	BESB03.11
19	Define Load Adaptive algorithm.	Understand	CO 4	BESB03.11
20	Difference between Bluetooth and WIFI	Remember	CO 4	BESB03.11
<b>Part – B (Long Answer Questions)</b>				
1	Explain in detail about Adhoc Networking? Distinguish Bluetooth piconet architecture and Bluetooth scatternet architecture with neat block diagram?	Understand	CO 4	BESB03.12
2	List out the specifications of Voice and data transmission in Bluetooth and interpret data and voice applications.	Remember	CO 4	BESB03.12
3	Explain the structure of physical and MAC layers of Bluetooth and illustrate how connection management is achieved?	Understand	CO 4	BESB03.12
4	Explain in detail about Wi-max Technology	Understand	CO 4	BESB03.12
5	Determine hopping rate of Bluetooth, and no of bits transmitted in one slot? If each frame of the HV3 voice packet in Bluetooth carries 40 bits of sample speech, what is the efficiency for packet transmission? How often do HV3 packets sent to support 128 kbps voice in each direction?	Remember	CO 4	BESB03.13
6	Illustrate the architecture of Bluetooth protocol stack and discuss the steps involved in Master / slave role switching	Understand	CO 4	BESB03.13
7	Explain the high level overview of Bluetooth security architecture with Security components.	Remember	CO 4	BESB03.13
8	Explain Bluetooth star architecture and discuss the security modes in Bluetooth generic access profile.	Understand	CO 4	BESB03.13
9	What are the attacks against WLANs and explain security measures. What is a benefit of IrDA as compared to Bluetooth?	Understand	CO 4	BESB03.13
10	Illustrate the following with architecture of physical and MAC layer details i) WPAN ii) Home RF	Remember	CO 4	BESB03.14
11	Illustrate how Bluetooth fits within Wifi, How many concurrently how many devices can connect? List out few applications of Bluetooth?	Understand	CO 4	BESB03.14
12	A symmetric 1-slot DM1 link between a master and a slave carries 276 bits per slot at a rate of 1600 slots per second (every other slot) in each direction. Find the associated data rate.	Remember	CO 4	BESB03.14
13	Discuss the different security levels and services offered by Bluetooth?	Understand	CO 4	BESB03.11

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
14	Discuss in detail about the application of traffic engineering and Qos ?	Understand	CO 4	BESB03.11
15	Discuss about WPAN Architecture in detail	Remember	CO 4	BESB03.09
<b>Part - C (Analytical Questions)</b>				
1	Determine hopping rate of Bluetooth, and no of bits transmitted in one slot? If each frame of the HV3 voice packet in Bluetooth carries 80 bits of sample speech, what is the efficiency for packet transmission? How often do HV3 packets sent to support 64 kbps voice in each direction?	Understand	CO 4	BESB03.14
2	A symmetric 1-slot DM1 link between a master and a slave carries 136 bits per slot at a rate of 800 slots per second (every other slot) in each direction. Find the associated data rate.	Understand	CO 4	BESB03.14
3	Explain about the Load Adaptive algorithm. What are the parameters to be considered for its functioning?	Understand	CO 4	BESB03.14
4	Explain the paging algorithm in the Bluetooth?	Understand	CO 4	BESB03.14
5	Interpret IEEE 802.15.3 high rate WAPNs with respect of protocol stack and network topology.	Understand	CO 4	BESB03.12
<b>UNIT-V</b>				
<b>THE IEEE 802.15 WORKING GROUP FOR WPANS</b>				
<b>Part - A (Short Answer Questions)</b>				
1	Define Zigbee technology?	Understand	CO 5	BESB03.13
2	List out the zigbee components and network topologies?	Understand	CO 5	BESB03.13
3	Draw the architecture for IEEE 802.15.4 WLAN	Understand	CO 5	BESB03.14
4	Define IEEE 802.15 3a ultra wide band	Understand	CO 5	BESB03.12
5	Illustrate Zigbee RF4CE version?	Understand	CO 5	BESB03.13
6	Explain Zigbee frame structure	Understand	CO 5	BESB03.13
7	Determine the highest possible data rate of an IrDA device?	Remember	CO 5	BESB03.08
8	Discuss the need to integrate Ad-Hoc networks with mobile IP?	Remember	CO 5	BESB03.08
9	List out the classification of routing protocols for Ad-Hoc networks	Understand	CO 5	BESB03.08
10	Justify the statement "Bluetooth is RF or IR"	Remember	CO 5	BESB03.11
11	Define IEEE 802.16 WiMAX standard.	Remember	CO 5	BESB03.13
12	List out the specifications of Zigbee technology.	Understand	CO 5	BESB03.13
13	What are the advantages of architecture of IEEE 802.15.3	Remember	CO 5	BESB03.13
14	Differentiate between ZigBee and Bluetooth technology	Understand	CO 5	BESB03.12
15	Explain IEEE 802.15.4 LR-WPAN device architecture	Remember	CO 5	BESB03.14

S. No	QUESTION	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
<b>Part - B (Long Answer Questions)</b>				
1	Classify Zigbee technology with Wi-Fi and Bluetooth and mention few applications of IEEE 802.15.3 Wireless personal area networks.	Understand	CO 5	BESB03.13
2	Explain ZigBee Technology architecture with components and network topologies with application?	Understand	CO 5	BESB03.13
3	List out the different frequency channels which supports are different PHY versions of zigbee and illustrate Zigbee RF4CE version?	Remember	CO 5	BESB03.13
4	Explain Zigbee frame structure with different fields and routing protocol?	Remember	CO 5	BESB03.13
5	Interpret IEEE 802.15.4 LR-WPAN Device architecture with neat block diagram and mention the advantages and disadvantages?	Understand	CO 5	BESB03.14
6	Mention the three error correction mechanism used by Bluetooth system and compare the benefits of IrDA verses Bluetooth.	Understand	CO 5	BESB03.11
7	Justify whether “Bluetooth is RF or IR” and discuss the Bluetooth protocol stack compared to OSI protocol model.	Remember	CO 5	BESB03.11
8	Illustrate short notes on, Physical Layer w.r.t IEEE 802.15.4 Data Link layer w.r.t IEEE 802.15.4	Remember	CO 5	BESB03.14
9	Discuss the need to integrate Ad-Hoc networks with mobile IP?	Understand	CO 5	BESB03.13
10	Why does TCP not perform well in Ad-Hoc wireless networks? What are the changes made to traditional networks to suit Ad-Hoc networking environment?	Understand	CO 5	BESB03.13
11	Explain IEEE 802.16 WiMAX standard and its protocol stack in detail?	Remember	CO 5	BESB03.13
12	Explain in detail about IEEE 802.15 working group for WPANS, and describe the IEEE 802.15.3 MAC with PHY layer in brief?	Remember	CO 5	BESB03.12
13	Explain in detail about the architecture of IEEE 802.15.3 with neat diagram and give its applications?	Understand	CO 5	BESB03.12
14	Explain in detail LR-WPAN device architecture with neat diagram?	Understand	CO 5	BESB03.14
15	Explain the characteristics of ideal Routing Protocols in Ad-Hoc Wireless network?	Understand	CO 5	BESB03.13
<b>Part - C (Analytical Questions)</b>				
1	Draw the IEEE 802.15.4 LR-WPAN device architecture and discuss about channel frequencies and PHY packet structure.	Remember	CO 5	BESB03.14
2	Explain all the power saving features of IEEE 802.15.4. and illustrate in which scenarios they are applicable?	Remember	CO 5	BESB03.12
3	Draw the IEEE 802.15.4 LR-WPAN device architecture and discuss about channel frequencies and Network layer packet structure?.	Remember	CO 5	BESB03.13
4	Draw the IEEE 802.15.4 LR-WPAN device architecture and discuss about channel frequencies and Data link layer packet structure?	Understand	CO 5	BESB03.12
5	Discuss in detail about the classification of routing protocols for Ad-Hoc networks, based on routing information mechanism?	Understand	CO 5	BESB03.13

**Prepared By:**

Ms. C Devisupraja, Assistant Professor, ECE

**HOD, ECE**