SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

VIII SEMESTER

1906803 – COGNITIVE RADIO

Regulation – 2019

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Prepared by

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SUBJECT : 1906803 – Cognitive Radio

SEM / YEAR: VIII / IV Year

UNIT I – INTRODUCTION TO SOFTWARE-DEFINED RADIO AND COGNITIVE RADIO

Evolution of Software Defined Radio and Cognitive Radio: Goals, Benefits, Definitions, Architectures, Relations with other radios, Issues, Enabling technologies, Radio Frequency Spectrum and Regulations. Cognitive techniques – Position awareness, Environment awareness in Cognitive Radios.

Part – A

Q. No	Questions	CO	BTL	Competence
1.	What is Software Defined Radio?	CO1	BTL 1	Remembering
2.	Define the basic concept of SDR.	CO1	BTL 2	Understanding
3.	Write the need of SDR.	CO1	BTL 2	Understanding
4.	Summarize the potential benefits of SDR.	CO1	BTL 2	Understanding
5.	What is Cognitive Radio?	CO1	BTL 1	Remembering
6.	Name the new application enabled by CR.	CO1	BTL 1	Remembering
7.	Outline the performance metric improved by CR.	CO1	BTL 2	Understanding
8.	Point out the tradeoffs required in SDR.	CO1	BTL 2	Understanding
9.	What is meant by spectrum pooling?	CO1	BTL 1	Remembering
10.	State spectrum hole.	CO1	BTL 2	Understanding
11.	List the architecture goals of SDR.	CO1	BTL 2	Understanding
12.	State spectrum agility.	CO1	BTL 2	Understanding
13.	Define the term Data Explosion.	CO1	BTL 1	Remembering
14.	Write the role of spectrum policy.	CO1	BTL 2	Understanding
15.	Summarize the functional highlights of SDR.	CO1	BTL 1	Remembering
16.	How to apply the property inheritance in SDR architecture	CO1	BTL 2	Understanding
17.	How does the hardware architecture support the SDR?	CO1	BTL 1	Remembering
18.	Identify the role of Software architecture in SDR.	CO1	BTL 2	Understanding
19.	Give the relationship between cognitive radio and SDR	CO1	BTL 2	Understanding
20.	Formulate the design rule in SDR architecture.	CO1	BTL 2	Understanding
21.	List the major applications of cognitive radio.	CO1	BTL 1	Remembering
22.	Classify the sensing mechanism in cognitive radios.	CO1	BTL 2	Understanding
23.	Name the methods to estimate the position using radio sensing.	CO1	BTL 1	Remembering

24.	How environment awareness acquires in cognitive radio?	CO1	BTL 1	Remembering
	Part – B			
1.	(i) Define spectrum efficiency under CR. (6) (ii) How is spectrum efficiency dependent on the various aspects of CR? (7)	CO1	BTL 3	Applying
2.	Draw the cognitive radio framework and explain each block. (13)	CO1	BTL 3	Applying
3.	Discuss the future of CR as a technology for the development of new applications. (13)	CO1	BTL 3	Applying
4.	Describe the challenges and opportunities of cognitive radio. (13)	CO1	BTL 4	Analyzing
5.	Explain the architecture of SDR with neat diagrams and its implications. (13)	CO1	BTL 4	Analyzing
6.	Explain environment aware cognitive radio in detail. (13)	CO1	BTL 3	Applying
7.	What are the primary concepts of Position awareness cognitive radio? Explain with neat architecture. (13)	CO1	BTL 3	Applying
8.	Discuss in detail about the potential benefits and technology tradeoffs in SDR. (13)	CO1	BTL 4	Analyzing
9.	Explain the network & hardware design considerations in SDR. (13)	CO1	BTL 4	Analyzing
10.	Discuss about standardization activity in cognitive radio. (13)	CO1	BTL 3	Applying
11.	With neat diagram, discover the essential functions of Software Radio. (13)	CO1	BTL 4	Analyzing
12.	Explain the architecture of SDR with neat diagrams and its implications. (13)	CO1	BTL 4	Analyzing
13.	Demonstrate the Conceptual model for cognitive radios with location and environment awareness cycles. (13)	CO1	BTL 3	Applying
14.	Examine how signals are acquired in Cognitive radio and explain about sensing mechanisms. (13)	CO1	BTL 3	Applying
15.	Summarize about the location and environment awareness in the nature and in wireless systems. (13)	CO1	BTL 3	Applying
16.	Explain about the Sensing interface. (13)	CO1	BTL 4	Analyzing
17.	Analyze the Self-aware network in Cognitive radio system. (13)	CO1	BTL 3	Applying
	Part – C			
1.	Distinguish software architecture from radio architecture. (15)	CO1	BTL 3	Applying
2.	Why do radio functions benefit from a layered approach tosoftware components? (15)	CO1	BTL 4	Analyzing
3.	(i) Mention about the Hardware architecture of SDR. (8) (ii) What are the user applications of SDR? (7)	CO1	BTL 4	Analyzing
4.	Outline the various functional allocation of software radio functional Model. (15)	CO1	BTL 3	Applying
5.	(i) Describe RF front end in SDR architecture. (7) (ii) Identify the components of Digital back end in SDR and explain. (8)	CO1	BTL 4	Analyzing

UNIT II – COGNITIVE RADIO ARCHITECTURE

Cognition cycle – orient, plan, decide and act phases, Inference Hierarchy, SDR as a platform for Cognitive Radio – Hardware and Software Architectures, Overview of IEEE 802.22 standard for broadband wireless access in TV bands.

Part – A

Q. No	Questions	CO	BTL	Competence
1.	What is waking behavior?	CO2	BTL 1	Remembering
2.	Draw are the architecture of the SDR.	CO2	BTL 1	Remembering
3.	List the limitations of SDR.	CO2	BTL 1	Remembering
4.	Compare cognitive radio and software radio.	CO2	BTL 1	Remembering
5.	List the primary functions of cognition.	CO2	BTL 1	Remembering
6.	Write the objective of cognitive radio architecture.	CO2	BTL 1	Remembering
7.	Mention some essential functions of the software radio.	CO2	BTL 2	Understanding
8.	Summarize about the binding in observe-phase data structures.	CO2	BTL 2	Understanding
9.	Compare software flexibility and affordability.	CO2	BTL 1	Remembering
10.	What are the acquisition parameters of software radios?	CO2	BTL 1	Remembering
11.	Explore how radio optimization of radio resources is achieved.	CO2	BTL 2	Understanding
12.	Point out the meaning of API.	CO2	BTL 1	Remembering
13.	Mention the parameters of cognition function.	CO2	BTL 2	Understanding
14.	What is a conflict?	CO2	BTL 1	Remembering
15.	Draw the physical architecture of CR	CO2	BTL 2	Understanding
16.	What is the objective of cognitive radio architecture?	CO2	BTL 1	Remembering
17.	Define behavior epoch.	CO2	BTL 1	Remembering
18.	Infer the components of cognitive functions.	CO2	BTL 2	Understanding
19.	What is the purpose of observe-phase data structures?	CO2	BTL 1	Remembering
20.	Mention the modes of behavior epoch.	CO2	BTL 2	Understanding
21.	State decide-phase components.	CO2	BTL 2	Understanding
22.	Justify SDR's capability to make it a Cognitive Radio with 3 major applications.	CO2	BTL 2	Understanding
23.	What is the use of plan phase components?	CO2	BTL 2	Understanding
24.	How CR can be realized using SDR.	CO2	BTL 1	Remembering

Part – B

1.	Discuss the components of orient, plan and decide phases in detail with flow diagrams. (13)	CO2	BTL 3	Applying
2.	(i) Describe RF front end in SDR architecture. (6) (ii) Identify the components of Digital back end in SDR and explain. (7)	CO2	BTL 3	Applying
3.	Devise the flexible functions of the component Architecture in Cognitive radio. (13)	CO2	BTL 4	Analyzing
4.	Elaborate the primary functions, components and design rules of cognitive Radio. (13)	CO2	BTL 3	Applying

5.	Categorize the Cognition Components based computational Intelligence and explain the components. (13)	CO2	BTL 3	Applying
6.	Point out the Modeled topological maps of CRA. (13)	CO2	BTL 3	Applying
7.	With neat architecture, explain the cognitive radio components. (13)	CO2	BTL 3	Applying
8.	What are the various levels of abstraction of the SW radio? (13)	CO2	BTL 2	Understanding
9.	Analyze the benefits of CR to users on the way to a vision of the future. (13)	CO2	BTL 3	Applying
10.	Determine the simplest CRA? How could the architecture evolve through initiatives such as The SDR Forum's CR special- interest group? (13)	CO2	BTL 3	Applying
11.	What is Cognition cycle? Discuss the various phases involved in cognition cycle with neat diagram. (13)	CO2	BTL 4	Analyzing
12.	Derive the various components of cognitive radio architecture. (13)	CO2	BTL 3	Applying
13.	Discuss the primary functions, components and design rules of Cognitive Radio. (13)	CO2	BTL 4	Analyzing
14.	Devise the flexible functions of the component Architecture in Cognitive radio. (13)	CO2	BTL 3	Applying
15.	Draw and explain the "Architecture maps' of Cognitive radio with neat diagram. (13)	CO2	BTL 3	Applying
16.	What is behavior? Explain the various modes of behavior. (13)	CO2	BTL 4	Analyzing
17.	Discuss the components of orient, plan and decide phases in detail. (13)	CO2	BTL 4	Analyzing
Part – C				
1.	With a neat diagram, explain the simplified cognition cycle. (15)	CO2	BTL 3	Applying
2.	List and explain the characteristics of radio cognition task. (15)	CO2	BTL 4	Analyzing
3.	What is Cognition Cycle? Discuss the various phases involved in cognition cycle with neat diagram. (15)	CO2	BTL 3	Applying
4.	Demonstrate how is regulatory rule making shaping CR markets? (15)	CO2	BTL 4	Analyzing
5.	Explore how CRA identifies self, owner and home network. (15)	CO2	BTL 3	Applying

UNIT III– NEXT GENERATION WIRLESS NETWORKS

The Next generation network architecture, Spectrum Sensing, Spectrum Management, SpectrumMobility, Spectrum Sharing

Part – A

Q. No	Questions	CO	BTL	Competence
1.	Define XG? What is the need of it?	CO3	BTL 1	Remembering
2.	What is spectrum Broker?	CO3	BTL 1	Remembering
3.	Summarize the main functions for cognitive radios in XG networks.	CO3	BTL 2	Understanding
4.	Write the concept of Spectrum Sensing.	CO3	BTL 2	Understanding
5.	What is meant by spectrum mobility?	CO3	BTL 1	Remembering
6.	How spectrum management is done with the help of cognitive radio?	CO3	BTL 1	Remembering
7.	What is spectrum sharing in cognitive radio networks?	CO3	BTL 2	Understanding

8.	State the applications of xG network?	CO3	BTL 2	Understanding
9.	Identify the transmitter detection problem using spectrum sharing in	CO3	BTL 2	Understanding
10.	Define cognitive capability.	CO3	BTL 2	Understanding
11.	Identify the disadvantage of energy detector.	CO3	BTL 1	Remembering
12.	List out the challenges of spectrum sensing.	CO3	BTL 1	Remembering
13.	Summarize the parameters of spectrum management.	CO3	BTL 2	Understanding
14.	Define spectrum hand off.	CO3	BTL 1	Remembering
15.	Mention the components of an XG network.	CO3	BTL 2	Understanding
16.	Name the Access types in XG networks.	CO3	BTL 1	Remembering
17.	Identify the parameters to represent the quality of the particular spectrum band.	CO3	BTL 2	Understanding
18.	List the major steps involved in the process of spectrum sharing.	CO3	BTL 2	Understanding
19.	State about the open research issues for routing in XG networks.	CO3	BTL 2	Understanding
20.	Define spectrum hand off latency.	CO3	BTL 2	Understanding
21.	Write the function of leased network.	CO3	BTL 1	Remembering
22.	What is the meaning of spectrum pooling?	CO3	BTL 1	Remembering
23.	Interpret the concept of OFDM in cognitive radio system?	CO3	BTL 2	Understanding
24.	Classify the spectrum sensing techniques.	CO3	BTL 2	Understanding
Part – B				
1.	Explain each component and its functionality of XG network architecture with neat diagram. (13)	CO3	BTL 4	Analyzing
2.	Describe about the spectrum sensing and primary user detection techniques. (13)	CO3	BTL 3	Applying
3.	Classify the spectrum sensing techniques, explain how it is utilized in matched filter detection model. (13)	CO3	BTL 4	Analyzing
4.	Explain the XG network communication components and their Interactions with Diagram. (13)	CO3	BTL 3	Applying
5.	Summarize the fundamental Limits of Cognitive Radio. (13)	CO3	BTL 3	Applying
6.	Elaborate the spectrum management challenges and the Spectrum Sharing. (13)	CO3	BTL 3	Applying
7.	Interpret the Centralized spectrum sharing and Distributed Spectrum sharing in XG networks. (13)	CO3	BTL 3	Applying
8.	Write the brief note on the parameters involved in Spectrum analysis of XG networks. (13)	CO3	BTL 3	Applying
9.	Describe about the energy detection technique. Also explainabout its feature under fading and non-zero mean case. (13)	CO3	BTL 4	Analyzing
10.	Assess the XG network functions with diagram. Evaluate the cases on which XG networks can be applied. (13)	CO3	BTL 3	Applying
11.	Describe the physical architecture, discuss about the uses, characteristics and objectives of cognitive radio in XG Network. (13)	CO3	BTL 4	Analyzing
12.	What are the challenges faced by spectrum sensing? Explain about Interference temperature model. (13)	CO3	BTL 4	Analyzing
13.	Explain how spectrum hand off occurs in XG networks. (13)	CO3	BTL 3	Applying
14.	Cite examples for Existing architectures for XG networks and write a brief note on it. (13)	CO3	BTL 3	Applying

15.	Explain the classification of next generation networks based on the access technology. (13)	CO3	BTL 4	Analyzing
16.	Illustrate the Inter network sharing in XG networks. Compare the Inter-network and intra-network sharing in XG networks. (13)	CO3	BTL 4	Analyzing
17.	Examine the steps involved in spectrum mobility in XG networks. (13)	CO3	BTL 4	Analyzing
Part – C				
1.	Propose a XG network considering architecture, spectrum allocation behavior and spectrum access techniques. (15)	CO3	BTL 4	Analyzing
2.	How transmitter detection takes place in XG networks based on energy. Explain how receiver uncertainty and shadowing uncertainty occurs? (15)	CO3	BTL 3	Applying
3.	Explain about spectrum sharing models for dynamic spectrum access. (15)	CO3	BTL 4	Analyzing
4.	Analyze the licensed and unlicensed Spectrum Sharing in XG network with example. (15)	CO3	BTL 4	Analyzing
5.	Write a brief note on the fundamental Tradeoffs in Spectral Sensing. (15)	CO3	BTL 4	Analyzing

UNIT - IV: MAC AND NETWORK LAYER DESIGN AND PROTOCOLS FOR COGNITIVE RADIO

MAC for cognitive radios – Polling, ALOHA, slotted ALOHA, CSMA, CSMA / CA, – MAC Protocols for Cognitive Radio infrastructure-based networks: Random access protocols, Time slotted protocols, Hybrid protocols - MAC Protocols for CR Ad hoc networks: Random access protocols, Time slotted protocols, Hybrid protocols - Network layer design – Routing in cognitive radios, Flow control and error control techniques.

Q. No	Questions	CO	BTL	Competence
1.	Define Polling.	CO4	BTL 1	Remembering
2.	What is a wireless sensor network?	CO4	BTL 2	Understanding
3.	Identify the characteristic requirements of MAC for Cognitive Network?	CO4	BTL 2	Understanding
4.	Examine how Slotted ALOHA differ from ALOHA?	CO4	BTL 2	Understanding
5.	Differentiate between CSMA and CSMA / CA	CO4	BTL 2	Understanding
6.	Outline Cognitive Radio infrastructure-based networks	CO4	BTL 2	Understanding
7.	Interpret the features of Cognitive Radio infrastructure based networks.	CO4	BTL 2	Understanding
8.	Summarize the Random-access protocols in Cognitive Radio infrastructure-based networks.	CO4	BTL 1	Remembering
9.	What is Polling in cognitive radios?	CO4	BTL 1	Remembering
10.	List advantages of multichannel MAC.	CO4	BTL 1	Remembering
11.	Write the key characteristics of Multiple Access Scheme.	CO4	BTL 1	Remembering
12.	List the characteristics of MAC Protocols for CR Ad-hoc networks	CO4	BTL 1	Remembering
13.	Explain P-Persistent CSMA	CO4	BTL 2	Understanding
14.	Exhibit the performance metrics of Random-Access Protocols in CR Ad-hoc networks	CO4	BTL 2	Understanding

15.	Depict Routing and Forwarding.	CO4	BTL 2	Understanding
16.	Compare Random access protocols, Time slotted protocols	CO4	BTL 2	Understanding
17.	Outline the use of Hybrid protocols	CO4	BTL 2	Understanding
18.	Mention about Routing in cognitive radios.	CO4	BTL 2	Understanding
19.	Compare Flow control and error control techniques	CO4	BTL 2	Understanding
20.	Explore the Network layer design	CO4	BTL 2	Understanding
21.	Classify the modes of operation of a sensor node.	CO4	BTL 2	Understanding
22.	Write about Slotted ALOHA.	CO4	BTL 1	Remembering
23.	Write the key characteristics of On Demand Routing.	CO4	BTL 2	Understanding
24.	Outline the Flow control of CRN.	CO4	BTL 2	Understanding
Part – B				
1.	Describe in detail about ALOHA, slotted ALOHA. (13)	CO4	BTL 4	Analyzing
2.	Write the important features of MAC for Cognitive Radios. (13)	CO4	BTL 3	Applying
3.	Draw the Multichannel MAC (Mc MAC) and describe in detail. (13)	CO4	BTL 3	Applying
4.	Sketch the Polling System and outline the behavior of Polling Service System. (13)	CO4	BTL 3	Applying
5.	Devise the possible sensors and actuators that can be usedto design a wireless sensor network. (13)	CO4	BTL 3	Applying
6.	Characterize the ALOHA and Slotted ALOHA in cognitive Radios. (13)	CO4	BTL 4	Analyzing
7.	Summarize P-Persistent CSMA and explain about the cycle of P-Persistent CSMA operations. (13)	CO4	BTL 4	Analyzing
8.	Interpret the CSMA and CSMA/CA for Cognitive Radios. (13)	CO4	BTL 4	Analyzing
9.	Analyze the Network Layer design and explain about Routing and forwarding. (13)	CO4	BTL 4	Analyzing
10.	Write a detailed notes on Routing in Cognitive radio Networks. (13)	CO4	BTL 3	Applying
11.	Deduce the Cognitive Radio infrastructure-based networks for Random access protocols, Time slotted protocols with an appropriate diagram. (13)	CO4	BTL 4	Analyzing
12.	Describe the MAC Protocols for CR Ad hoc networks. (13)	CO4	BTL 4	Analyzing
13.	Explain about Hybrid protocols in Cognitive Radio infrastructure based networks. (13)	CO4	BTL 4	Analyzing
14.	Generalize the Error Control technique in Cognitive Radio. (13)	CO4	BTL 4	Analyzing
15.	Explain how Routing mechanism works in cognitive radios. (13)	CO4	BTL 4	Analyzing
16.	Express how Ad- hoc networks illustrated in Cognitive Radio Networks. (13)	CO4	BTL 4	Analyzing
17.	Explain the Network layer design in Cognitive Radios. (13)	CO4	BTL 3	Applying
Part – C				
1.	Explain the Polling service system in Cognitive Radios. (15)	CO4	BTL 4	Analyzing
2.	Analyze the operation of CSMA and CSMA / CA in detail. (15)	CO4	BTL 4	Analyzing
3.	Write a brief note on the performance of Cognitive Radio infrastructure-based networks with necessary diagrams. (15)	CO4	BTL 4	Analyzing

4.	Illustrate the function of Network layer design in Cognitive Radios. (15)	CO4	BTL 4	Analyzing
5.	Formulate the Routing mechanism in cognitive radio networks. (15)	CO4	BTL 3	Applying

UNIT - V: ADVANCED TRENDS IN COGNITIVE RADIO

Overview of security issues in cognitive radios, Auction based spectrum markets in cognitive radio networks, public safety and cognitive radio, Cognitive radio for Internet of Things. Cognitive Radio in Wireless Sensor Networks, Applications of machine learning to cognitive radio networks.

Q. No	Questions	CO	BTL	Competence
1.	Define Primary User Emulation Attack (PUEA).	CO5	BTL 1	Remembering
2.	Classify the PUE Attack.	CO5	BTL 2	Understanding
3.	Identify the characteristics of Distributed Spectrum Sensing.	CO5	BTL 2	Understanding
4.	Examine how Byzantine Failure in Data fusion	CO5	BTL 2	Understanding
5.	Explain about dynamic spectrum micro auctions	CO5	BTL 2	Understanding
6.	Outline On demand Spectrum auctions.	CO5	BTL 2	Understanding
7.	Interpret the Pricing Models	CO5	BTL 2	Understanding
8.	Summarize the double spectrum auction for multiparty trading.	CO5	BTL 1	Remembering
9.	Write the public safety communication standards	CO5	BTL 1	Remembering
10.	List the benefits of Cognitive radio related to Emergency conditions.	CO5	BTL 1	Remembering
11.	Write the applications of Cognitive radio	CO5	BTL 1	Remembering
12.	List the 4 stages of IoT in Cognitive radios	CO5	BTL 1	Remembering
13.	Explain the motivation for using CR in IoT	CO5	BTL 2	Understanding
14.	Exhibit the benefits of cognitive radio for IoT	CO5	BTL 2	Understanding
15.	Depict the cognitive radio in wireless network?	CO5	BTL 2	Understanding
16.	Compare Wireless sensor networks and Cognitive Wireless sensor networks	CO5	BTL 2	Understanding
17.	Outline the benefits of Cognitive radio for Internet of Things	CO5	BTL 2	Understanding
18.	What are the examples of the cognitive technologies of AI?	CO5	BTL 1	Remembering
19.	What are the applications of cognitive radio sensor networks?	CO5	BTL 1	Remembering
20.	Explore Applications of machine learning to cognitive radio networks.	CO5	BTL 1	Remembering
21.	Which capability was enhanced upon application of machine learning in cognitive radio?	CO5	BTL 1	Remembering
22.	Write about Auction based spectrum markets in cognitive radio networks	CO5	BTL 1	Remembering
23.	What is cognitive radio in network security?	CO5	BTL 1	Remembering
24.	What are the advantages of cognitive radio wireless sensor networks?	CO5	BTL 1	Remembering

Part – B

1.	Describe the overview of security threads to incumbent coexistence. (13)	CO5	BTL 2	Understanding
2.	Write the important features of security threads to self-coexistence. (13)	CO5	BTL 3	Applying
3.	Describe in detail about the Radio Software security threads and explain about PUEA. (13)	CO5	BTL 4	Analyzing
4.	Sketch the PUE Attacks and outline the classification PUE attack. (13)	CO5	BTL 3	Applying
5.	Explain in detail about Distributed Spectrum sensing. (13)	CO5	BTL 3	Applying
6.	Characterize the Auction based spectrum markets incognitive radio networks. (13)	CO5	BTL 4	Analyzing
7.	Summarize the Dynamic spectrum micro auctions and role of cognitive radios. (13)	CO5	BTL 3	Applying
8.	Interpret the double spectrum auctions for multiparty trading. (13)	CO5	BTL 3	Applying
9.	Analyze the Public safety and Cognitive Radio in detail. (13)	CO5	BTL 4	Analyzing
10.	Write the benefits cognitive radio related to the emergency conditions. (13)	CO5	BTL 3	Applying
11.	Deduce the Public safety communication standards in Cognitive radios. (13)	CO5	BTL 4	Analyzing
12.	Describe the Applications of Cognitive radios. (13)	CO5	BTL 3	Applying
13.	Explain about the Cognitive Radio for IoT Applications in detail. (13)	CO5	BTL 4	Analyzing
14.	Generalize the Cognitive Radio in Wireless sensor network with suitable diagram. (13)	CO5	BTL 2	Understanding
15.	Explain the standardization and Security and Privacy efforts in cognitive radio based IoT. (13)	CO5	BTL 4	Analyzing
16.	Express the applications of machine learning to cognitiveradio networks. (13)	CO5	BTL 3	Applying
17.	Explain in detail about the Wireless Sensor Network in Cognitive Radios. (13)	CO5	BTL 3	Applying
Part – C				
1.	Explain the Cognitive Radio for IoT Applications in detail. (15)	CO5	BTL 3	Applying
2.	Analyze the Radio Software security threads and explain about PUEA. (15)	CO5	BTL 4	Analyzing
3.	Write a brief note on the performance of Wireless Sensor Network in Cognitive Radios. (15)	CO5	BTL 3	Applying
4.	Illustrate the applications of machine learning to cognitiveradio networks. (15)	CO5	BTL 4	Analyzing
5.	Formulate the Public safety communication standards in Cognitive radios. (15)	CO5	BTL 3	Applying