



**M.E. DEGREE EXAMINATIONS: DEC 2022**

(Regulation 2018)

Third Semester

**COMMUNICATION SYSTEMS**

P18COE0306: LoRa Technology

**COURSE OUTCOMES**

- CO1:** Explain the impact of the LPWAN design on the Internet of Things
- CO2:** Examine and critique some of the most important message formats and interaction patterns being used on the World Wide Web and the IoT
- CO3:** Explore several standards that play a significant role in the Internet of Things
- CO4:** Develop and build LPWAN

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions**

**PART A (10 x 1 = 10 Marks)**

1. Assertion (A): LoRa is one of the LPWAN technologies CO1 [K<sub>2</sub>]  
Reason (R): Power optimization feature can be used to minimize the power utilized
 

a) Both A and R are correct and R is the correct explanation of A c) A is correct but R is not correct	b) Both A and R are correct but R is NOT the correct explanation of A d) A is not correct but R is correct
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2. Types of roaming supported by LoRaWAN CO2 [K<sub>2</sub>]

a) Passive roaming c) Handover roaming	b) Active roaming d) Both A and C
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3. Which is the electric information service infrastructure, that is placed between end-user and the power utility? CO2 [K<sub>3</sub>]

a) Home Automation c) Home Automation Networking	b) Advanced Metering Infrastructure (AMI) d) Home Networking
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4.	<b>List I</b>	<b>List II</b>	CO3 [K <sub>3</sub> ]
	A. HTTP	i. Physical Layer	
	B. DNS	ii. Network Layer	
	C. IP	iii. Session Layer	
	D. LORA	iv. Application Layer	

	A	B	C	D
a)	i	ii	iv	iii
b)	ii	iii	iii	ii
c)	iii	iv	ii	iv
d)	iv	i	i	i

5. Assertion (A): MQTT is message oriented CO3 [K<sub>2</sub>]  
Reason (R): Every message is a discrete chunk of data, opaque to the broker
- a) Both A and R are correct and R is the correct explanation of A      b) Both A and R are correct but R is NOT the correct explanation of A  
c) A is correct but R is not correct      d) A is not correct but R is correct
6. What is meant by payload? CO4 [K<sub>1</sub>]
- a) The payload refers to the equipment used to provide the service for which the satellite has been launched.      b) The payload refers to the equipment used to provide the service for which the satellite has been stabilize in orbit  
c) It produces solar power to the satellite      d) a & b
7. Gateway software developed should be smart enough to handle CO3 [K<sub>3</sub>]
- a) GPS      b) Message  
c) Logging      d) Processor
8. Assertion (A): BLE uses less power to transmit distance over a short distance CO2 [K<sub>2</sub>]  
Reason (R): It uses the same 2.3 GHz radio frequencies as classic Bluetooth
- a) Both A and R are correct and R is the correct explanation of A      b) Both A and R are correct but R is NOT the correct explanation of A  
c) A is correct but R is not correct      d) A is not correct but R is correct
9. Gateway provides the connection between \_\_\_\_\_ and \_\_\_\_\_ CO4 [K<sub>2</sub>]
- a) Cloud and controller      b) Network and Cloud  
c) Network and Controller      d) Controller and device
10. What is the maximum signaling rate if the Operates in the 5 GHz frequency range of the IEEE 802.11a standard? CO3 [K<sub>2</sub>]
- a) 12 Mbps      b) 54 Mbps  
c) 100 Mbps      d) 1 Gbps

**PART B (10 x 2 = 20 Marks)**

11. List few wired and wireless communication technologies CO1 [K<sub>2</sub>]
12. Classify the types of devices classes of LoRaWAN CO1 [K<sub>3</sub>]
13. Categorize LoRaWAN messages based on the direction they travel? CO1 [K<sub>3</sub>]
14. What are the suitable use-cases for LoRaWAN? CO2 [K<sub>1</sub>]

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| 15. Define data modeling.  | CO3 | [K <sub>1</sub> ] |
| 16. List few data visualization tools.   | CO3 | [K <sub>2</sub> ] |
| 17. What are the 3 types of GPS?   | CO4 | [K <sub>1</sub> ] |
| 18. Mention methods to activate end device in LoRaWAN.                             | CO4 | [K <sub>2</sub> ] |
| 19. Interpret interoperability between Wi-Fi and LoraWAN                           | CO2 | [K <sub>2</sub> ] |
| 20. What the transmission parameters of an end device controlled by ADR mechanism? | CO4 | [K <sub>1</sub> ] |

**PART C (10 x 5 = 50 Marks)**

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| 21. Summarize about LoRa and LoRaWAN   | CO1 | [K <sub>3</sub> ] |
| 22. Develop a LoRa based solution with neat sketch                               | CO1 | [K <sub>4</sub> ] |
| 23. Discuss about LoRaWAN Architecture   | CO1 | [K <sub>3</sub> ] |
| 24. Discuss about LoRaWAN security   | CO3 | [K <sub>3</sub> ] |
| 25. Discuss about challenges in deploying LoRaWAN for an application             | CO2 | [K <sub>3</sub> ] |
| 26. Describe MQTT Protocol.  | CO2 | [K <sub>1</sub> ] |
| 27. Illustrate payload formatting functions of LoRaWAN                           | CO3 | [K <sub>2</sub> ] |
| 28. Interpret the key differences between Grafana and InfluxDB                   | CO4 | [K <sub>3</sub> ] |
| 29. Illustrate the process to create Node-RED for sending and receiving messages | CO4 | [K <sub>2</sub> ] |
| 30. Explain about large scale deployment of End nodes in LoraWAN gateways        | CO3 | [K <sub>2</sub> ] |

**Answer any TWO Questions**

**PART D (2 x 10 = 20 Marks)**

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| 31. Compare LoRa with other communication technologies in terms of bandwidth and range | CO1 | [K <sub>3</sub> ] |
| 32. Construct a LoRa based security surveillance system for an apartment               | CO3 | [K <sub>4</sub> ] |
| 33. Build a REST API with HTTP proxy integration                                       | CO2 | [K <sub>3</sub> ] |

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