Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 17 – 12- 2025 **Time:** 01:00pm – 04:00pm

School: SOCSE	**Program:** IoT	
Course Code : CIT3400	**Course Name:** Architecting smart IoT devices	
Semester: V	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	25	25	25	25	-

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Why is edge analytics preferred over cloud analytics in certain IoT applications? Give one example	2 Marks	L1	CO1
2.	What factors influence the selection of a radio module during IoT prototyping?	2 Marks	L1	CO1
3.	What is the function of an IoT gateway, and how does it enhance security and protocol translation?	2 Marks	L2	CO1
4.	List any two communication protocols commonly used to exchange data between IoT devices and the cloud.	2 Marks	L2	CO2
5.	How does a device abstraction layer improve portability across different IoT hardware platforms?	2 Marks	L2	CO2
6.	In an RTOS environment, why is excessive time spent with interrupts disabled inside an Interrupt Service Routine (ISR) detrimental to system performance?	2 Marks	L3	CO3
7.	What is the purpose of *signals* in an RTOS? Give one example of their use	2 Marks	L2	CO3

8.	Mention any two methods used to optimize RTOS performance and provide one example for each.	2 Marks	L2	CO3
9.	What is the purpose of the YANG data modelling language in IoT network configuration?	2 Marks	L1	CO4
10.	List any two benefits of using automation tools in IoT device deployment.	2 Marks	L1	CO4

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Discuss how data analytics supports decision-making in IoT systems. Compare edge analytics and cloud analytics in terms of latency, bandwidth, and reliability.	10 Marks	L1	CO1
		Or			
12.	**a.**	Explain the hardware prototyping process of an IoT device, highlighting the role of microcontrollers, sensors, and communication modules.	10 Marks	L1	CO1

13	**a.**	List the key web connectivity protocols used in IoT systems and explain why MQTT is considered more suitable for IoT applications compared to HTTP	10 Marks	L2	CO1
		Or			
14.	**a.**	Explain the key features of LTE-M and discuss why LTE-M is more suitable for IoT applications compared to standard LTE	10 Marks	L1	CO1

15.	**a.**	What are the common debugging tools available in an Integrated Development Environment (IDE)? Explain how these tools are used at the end of prototyping to identify and resolve the root cause of a problem. Illustrate your answer with a suitable example.	10 Marks	L2	CO2
		Or			
16.	**a.**	What is a profiler in an Integrated Development Environment (IDE)? Explain the procedure for measuring the execution time of a task using the profiler during the prototyping stage of an IoT device. Discuss the key micro-architectural features that must be considered during profiling for performance analysis.	10 Marks	L2	CO2

17.	**a.**	Explain the working of a *smart irrigation system* using a *DHT sensor* in an IoT environment. Describe how temperature and humidity data from the DHT sensor are acquired and processed by a microcontroller to control water flow automatically. Include a neat block diagram showing sensor, controller, actuator, and IoT connectivity	10 Marks	L3	CO2
		Or			
18.	**a.**	Explain the working of a *temperature control system* using a *digital temperature sensor* in an IoT environment. Describe how sensor data is acquired, processed by a microcontroller, and used to control actuators for maintaining the desired temperature. Include a neat block diagram	10 Marks	L3	CO2

19.	**a.**	A real-time embedded controller runs three periodic tasks under preemptive fixed-priority scheduling (Rate Monotonic Scheduling). The system parameters are: Task Period (ms) WCET (µs) Priority (1 = highest) T_1 5 400 1 T_2 10 700 2 T_3 20 1800 3 a) Determine whether the task set is schedulable using both utilization-based and response-time-based analyses. b) Explain how changes in WCET estimation accuracy (over- or under-estimation) influence the schedulability decision and system safety.	10 Marks	L2	CO3
	b.	Explain the challenges involved in *migrating an application from one platform to another* in an embedded or IoT environment. Describe how *CPU utilization* can be monitored during migration to ensure optimal performance, and discuss the techniques used to *avoid system failure* after migration.	10 Marks	L3	CO3
		Or			
20.	**a.**	The primary optimization method for **Nucleus SE** is static configuration. Suppose a developer is defining a set of tasks set {T1, T2} where T1 has a utilization U1=0.6 and T2 has U2=0.5. 1. What is the necessary scheduling condition violated by this task set, and what is the immediate consequence?	10 Marks	L3	CO3

		2. If the developer configures a static **memory pool** for communication instead of using a general heap, how does this specific configuration choice improve the system's ability to meet task deadlines?			
	b.	An IoT gateway connects multiple smart home sensors (temperature, motion, gas leak) to a central server. The system needs to: • Continuously collect data from multiple sensors, • Process data locally (filter noise), and • Handle user configuration requests from a mobile app. Explain how poor synchronization between threads can affect real-time data updates to the cloud.	10 Marks	L3	CO3

21.	**a.**	With a neat diagram, explain the NETCONF client–server architecture. Describe how an IoT gateway uses NETCONF to configure edge sensors and actuators, including capabilities exchange, session establishment, and remote configuration	10 Marks	L1	CO4
	b.	Discuss the architecture and features of pcDuino used in IoT applications. Explain how it supports sensor interfacing, communication, and cloud connectivity	10 Marks	L3	CO4
		Or			
22.	**a.**	Describe the architecture and connectivity features of the CubieBoard. Compare it briefly with other IoT prototyping boards.	10 Marks	L1	CO4
	b.	Describe the architecture and working of the Chef tool in IoT environments. Include a neat diagram showing Chef server, client, and workstation interaction	10 Marks	L2	CO4