



**SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(AUTONOMOUS)**

QUESTION BANK

Year / Semester: III B.Tech VI Semester

Regulation: R23

Subject and Code: EMBEDDED SYSTEMS AND IOT (23ECE364B)

SYLLABUS

UNIT I - EMBEDDED SYSTEMS AND INTERNET OF THINGS (9)

Introduction, Hardware & Software Architecture of Embedded Systems, Embedded Systems Development process, Architecture of Internet of Things, Physical Design & Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Tools, Applications of Embedded Systems and IoT, Design Methodology for IOT Products.

UNIT II- ARM MICROCONTROLLERS ARCHITECTURE AND PROGRAMMING (9)

Architecture, Pin Diagram, Register Set & Modes, Memory Organization, Instruction set, Programming ports, Timer/Counter, Serial communication, I/O System, Development Tools, interrupts in C, Introduction ARM mBed platform.

UNIT III - FUNDAMENTALS OF PYTHON PROGRAMMING & RASPBERRY PI (9)

Introduction to python programming, Data Types & Data Structures, working with functions, Modules & Packages, File Handling, classes, REST full Web Services, Client Libraries, Introduction & programming Raspberry Pi3, Interfaces, Integrating Input Output devices with Raspberry Pi3

UNIT IV - IOT TECHNOLOGIES, STANDARDS, TOOLS & M2M NETWORK (9)

Fundamental characteristics and high level requirements of IoT, IoT Reference models; Introduction to Communication Technologies & Protocols of IoT: BLE, Wi-Fi, LoRA, 3G/4G Technologies and HTTP, MQTT, CoAP protocols; Relevant Practicals on above technologies, M2M Network, SDN (Software Defined Networking) & NFV (Network Function Virtualization) for IoT

UNIT V- IOT PLATFORM, CLOUD COMPUTING PLATFORMS & DATA ANALYTICS FOR IOT DEVELOPMENT (9)

IOT Platform Architecture (IBM Internet of Things & Watson Platforms); API Endpoints for Platform Services; Devices Creation and Data Transmission; Introduction to NODE-RED and Application deployment, Introduction to Data Analytics, Apache Hadoop, Apache Oozie, Spark & Storm.



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Max Marks: 10

S.No.	CO	Questions	BT
Unit I: EMBEDDED SYSTEMS AND INTERNET OF THINGS			
1	1	a. Define Embedded System and list its components with diagram. b. Define Internet of Things (IoT) and list IoT enabling technologies.	L4
2	1	Explain Hardware and Software Architecture of Embedded Systems with neat diagram.	L3
3	1	a. Explain the Embedded System Development Process. b. Explain IoT Architecture with neat diagram.	L4
4	1	a. Explain Physical Design and Logical Design of IoT. b. Explain IoT Levels and Deployment Tools.	L3
5	1	Design Methodology for IoT Product Development with example.	L5
6	1	Differentiate IoT Levels with examples.	L4
7	1	Justify the need for Embedded Systems in modern applications.	L3
8	1	Evaluate IoT Deployment Tools.	L5
9	1	Design IoT system for Smart Healthcare.	L4
10	1	Judge the effectiveness of IoT in smart city applications	L3



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11	1	Explain IoT Enabling Technologies.	L3
S.No.	CO	Questions	BT
Unit II: ARM MICROCONTROLLERS ARCHITECTURE AND PROGRAMMING			
1	2	Explain the Architecture of ARM Microcontroller with neat diagram.	L4
2	2	Describe the Pin Diagram of ARM Microcontroller.	L3
3	2	a. Explain the Register Set of ARM Microcontroller. b. List and explain the ARM Instruction Set.	L4
4	2	Explain different Operating Modes of ARM Microcontroller.	L3
5	2	Explain Memory Organization of ARM Microcontroller with diagram.	L5
6	2	a. Explain Programming Ports in ARM Microcontroller. b. Explain Timer/Counter operation in ARM Microcontroller.	L4
7	2	a. Explain Serial Communication in ARM Microcontroller. b. Explain I/O System of ARM Microcontroller.	L3
8	2	Develop ARM program using Interrupts in C.	L4
9	2	Evaluate the performance of ARM Microcontroller in Embedded Systems.	L3
10	2	Justify the use of ARM Microcontroller in real-time applications.	L4



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S.No.	CO	Questions	BT
Unit III: FUNDAMENTALS OF PYTHON PROGRAMMING & RASPBERRY Pi			
1	3	Explain the basic structure of a Python program with example.	L4
2	3	a. Explain Python Data Types with examples. b. Explain different Data Structures in Python.	L3
3	3	a. Explain File Handling in Python. b. Explain Classes and Objects in Python.	L4
4	3	Explain Raspberry Pi 3 Architecture and features.	L3
5	3	a. Explain Interfaces of Raspberry Pi 3. b. Explain Client Libraries in Python.	L5
6	3	a. Compare List, Tuple, and Dictionary in Python. b. Analyze the importance of Modules in Python programming	L4
7	3	Evaluate the advantages of Python in Embedded Systems.	L3
8	3	Justify the use of Raspberry Pi 3 in IoT applications.	L5
9	3	Write a Python program using functions to perform arithmetic operations.	L4
10	3	Write a Python program to read and write a file.	L3



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11	3	Explain working with Functions in Python with example	L3
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S.No.	CO	Questions	BT
Unit IV: IOT TECHNOLOGIES, STANDARDS, TOOLS & M2M NETWORK			
1	4	Define Internet of Things (IoT) and explain its fundamental characteristics.	L4
2	4	Explain Communication Technologies used in IoT.	L3
3	4	Explain HTTP protocol in IoT with diagram.	L4
4	4	Demonstrate how MQTT protocol is used in IoT applications.	L3
5	4	Explain Machine to Machine (M2M) communication with diagram.	L5
6	4	a. Explain SDN architecture for IoT. b. Explain NFV architecture for IoT.	L4
7	4	a. Compare BLE, Wi-Fi and LoRa technologies. b. Compare HTTP, MQTT and CoAP protocols.	L3
8	4	a. Develop IoT system using BLE technology. b. Design IoT architecture using SDN and NFV.	L5
9	4	a. Explain Wi-Fi technology in IoT. b. Explain LoRa technology in IoT.	L4



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10	4	a. Explain MQTT protocol. b. Explain CoAP protocol.	L3
11	4	a. Explain 3G/4G technologies used in IoT. b. Explain IoT Reference Model with neat diagram.	L3

S.No.	CO	Questions	BT
Unit V: IOT PLATFORM, CLOUD COMPUTING PLATFORMS & DATA ANALYTICS FOR IOT DEVELOPMENT			
1	5	a. Explain the role of Data Analytics in IoT. b. Explain IBM Internet of Things Platform.	L4
2	5	Apply Node-RED to develop IoT application.	L3
3	5	Demonstrate data transmission from device to cloud platform.	L4
4	5	Explain Apache Spark Architecture and working.	L3
5	5	Develop complete IoT system with device, cloud and analytics.	L5
6	5	a. Compare Hadoop and Spark. b. Analyze the role of API in IoT platform.	L4
8	5	Design Big Data Analytics system using Hadoop and Spark.	L5
9	5	Develop IoT application using Node-RED.	L4



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10	5	Demonstrate data transmission from device to cloud platform.	L3
11	5	Implement Hadoop for IoT data storage.	L3

Note: L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, and L6-Creating

TEXT BOOKS:

1. Arsheep Bahga , Vijay Madiseti , —Internet of Things: A Hands-On Approach, 1st Edition, VPT, 2014.
2. K.V.K.K.Prasad, —Embedded Real Time Systems: Concepts, Design and Programming, 1st Edition, Dreamtech Publication, 2014.
3. Adrian McEwen, Hakim Cassimally, —Designing the Internet of Things, Wiley Publications, 2013.

REFERENCE BOOKS:

1. Jonathan W Valvano, —Embedded Microcomputer Systems: Real-Time Interfacing, 3rd Edition, Thomson Engineering, 2012.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things: Key applications and Protocols, 2nd Edition, Wiley Publications, 2012.
3. Rene Beuchat, Andrea Guerrieri & Sahand Kashani —Fundamentals of System-on-Chip Design on Arm Cortex-M Microcontrollers Paperback, 2 August 2021.

Instruction to Faculty Members:

The Six Levels of Bloom's Taxonomy:

1. **Remembering:** Retrieving, recognizing, and recalling relevant knowledge from long-term memory (e.g., list, define, name, locate).
2. **Understanding:** Constructing meaning, explaining ideas, or concepts (e.g., summarize, interpret, classify, compare).
3. **Applying:** Using information in new situations or implementing procedures to solve problems (e.g., solve, use, demonstrate, implement).



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4. **Analyzing:** Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure (e.g., contrast, categorize, distinguish, diagram).
5. **Evaluating:** Making judgments based on criteria and standards through checking and critiquing (e.g., judge, critique, justify, defend, argue).
6. **Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure (e.g., design, construct, develop, formulate).