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.

Prepared by
Dr.K.VarunKumar and Ms.M.Padma

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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**

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 Madisetti , —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).

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