SIDDHARTH INSTITUTEOF ENGINEERING & TECHNOLOGY::PUTTUR
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QUESTIONBANK(DESCRIPTIVE)

Subject with Code: Embedded Systems and IoT (23EC0431) **Course & Branch**: B.Tech-ECE

Regulation: R23 **Year & Sem:** III-B.Tech& II-Sem

UNIT-1
Introduction to Embedded System and Internet of Things

1	**a**	What is an embedded system? Give one example.	[L1][CO1]	**[2M]**
	b	Define Internet of Things (IoT).	[L1][CO1]	**[2M]**
	c	Mention any two functions of an embedded operating system	[L1][CO1]	**[2M]**
	d	What are IoT levels?	[L1][CO1]	**[2M]**
	e	Mention any two steps in IoT product design.	[L1][CO1]	**[2M]**
2	**a**	Define an embedded system and write any four important characteristics of embedded systems	[L1][CO1]	**[5M]**
	b	Explain the different classifications of embedded systems. Give an example for each	[L2][CO1]	**[5M]**
3	**a**	What are the primary hardware components of an embedded system, and how do they interact?	[L2][CO1]	**[6M]**
	b	List various applications of embedded systems.	[L1][CO1]	**[4M]**
4	**a**	Describe languages software tools used in embedded system development	[L2][CO1]	**[5M]**
	b	Describe the IDE tools for developing applications on an embedded system	[L2][CO1]	**[5M]**
5	**a**	Define IoT and describe the characteristics	[L2][CO1]	**[4M]**
	b	Illustrate the physical design with a generic block diagram of an IoT device and explain it briefly.	[L2][CO1]	**[6M]**
6	**a**	Draw and explain the architecture of Internet of Things.	[L3][CO1]	**[5M]**
	b	With a neat sketch, explain the Logical Design of an IoT.	[L3][CO1]	**[5M]**
7	**a**	Explain the IoT-enabling technologies, such as wireless sensor networks and cloud computing, and define their characteristics.	[L2][CO1]	**[5M]**
	b	Explain in brief IoT applications	[L2][CO1]	**[5M]**
8		With the help of neat diagrams, describe the level 1 to level 6 of IoT and Deployment Templates with an example.	[L3][CO1]	**[10M]**
9	**a**	Compare the various levels of IoT's in detail.	[L4][CO1]	**[5M]**
	b	Explain how IoT technology can used in cities the following application areas: (i) Smart Parking system (ii) Smart roads	[L2][CO1]	**[5M]**
10		Describe how the environment can be more protected with the help of IoT technology in the following categories: (i)Air pollution monitoring (ii)Noise pollution monitoring (iii)Forest fire detection (iv)River flood detection	[L2][CO1]	**[10M]**
11		Explain the design methodology in IoT. Give any one example of an IoT product?	[L2][CO1]	**[10M]**

UNIT–II
ARM Microcontrollers Architecture and Programming

1	**a**	What are the key features of ARM architecture compared to 8051 and 8086?	[L1][CO2]	**[2M]**
	b	Define little-endian and big-endian format.	[L1][CO2]	**[2M]**
	c	Mention the role of Timer/Counter in ARM.	[L1][CO2]	**[2M]**
	d	What is an Interrupt Service Routine (ISR)?	[L1][CO2]	**[2M]**
	e	What is the purpose of **JTAG pins** in ARM?	[L1][CO2]	**[2M]**
2		Explain the architecture of ARM processor with neat block diagram?	[L3][CO2]	**[10M]**
3	**a**	Explain the classifications of ARM processors based on application requirements?	[L2][CO2]	**[5M]**
	b	Explain different types of ARM instructions: i) Data processing ii) Branch instructions iii) Load/Store instructions	[L2][CO2]	**[5M]**
4		Describe the pin configuration of ARM processor with suitable diagram?	[L2][CO2]	**[10M]**
5	**a**	Explain the **register organization** of ARM processor.	[L2][CO2]	**[5M]**
	b	Describe the various **operating modes** of ARM processor?	[L2][CO2]	**[5M]**
6	**a**	Explain the memory organization of ARM processor with neat diagram?	[L3][CO2]	**[5M]**
	b	Compare **Flash, SRAM and EEPROM** in ARM controllers.	[L4]CO2]	**[5M]**
7	**a**	List and explain common development tools used with ARM.	[L2][CO2]	**[5M]**
	b	Explain the I/O system of ARM micro controller?	[L2][CO2]	**[5M]**
8	**a**	Explain the GPIO programming model of ARM based Microcontroller.	[L3][CO2]	**[5M]**
	b	Explain the working of **Timer/Counter** in ARM based Microcontroller.	[L3][CO2]	**[5M]**
9	**a**	Discuss the types of interrupts in ARM based Microcontroller?	[L2][CO2]	**[5M]**
	b	Explain about interrupt handling mechanism in ARM.	[L3][CO2]	**[5M]**
10	**a**	Write a program to transmit “HELLO” using UART0.	[L3][CO5]	**[5M]**
	b	Differentiate between UART, SPI, and I2C in ARM.	[L4]CO2]	**[5M]**
11	**a**	What is ARM mBed OS? List its features.	[L1][CO2]	**[5M]**
	b	Explain theARM mBed platform and its importance in Embedded system development.	[L2][CO5]	**[5M]**

UNIT–III
Fundamentals of Python programming & Raspberry Pi

1	**a**	What is indentation in Python and why is it important?	[L1][CO3]	**[2M]**
	b	Differentiate between list and tuple in Python	[L2][CO3]	**[2M]**
	c	What is a module? Give one example	[L1][CO3]	**[2M]**
	d	Define REST API	[L1][CO3]	**[2M]**
	e	What is a GPIO pin in Raspberry Pi	[L1][CO3]	**[2M]**
2	**a**	Explain the features of Python that make it suitable for rapid application development.	[L2][CO3]	**[5M]**
	b	Write any five Python built-in functions and explain their purpose with examples	[L2][CO3]	**[5M]**
3	**a**	Describe the Python execution model with a neat diagram (source code → bytecode → interpreter).	[L3][CO3]	**[5M]**
	b	Describe any four Python data types with suitable examples	[L2][CO3]	**[5M]**
4	**a**	Explain lists and tuples. Compare them with examples	[L4][CO3]	**[5M]**
	b	What are dictionaries in Python? Explain their operations with code snippets	[L3][CO3]	**[5M]**
5	**a**	Write a note on mutable vs immutable objects with examples	[L1][CO3]	**[5M]**
	b	Explain different types of function arguments in Python with examples	[L2][CO3]	**[5M]**
6	**a**	What is recursion? Write a recursive function to compute factorial of a number.	[L3][CO3]	**[5M]**
	b	What is a module? How do you create and import a module in Python? Explain with example.	[L3][CO5]	**[5M]**
7	**a**	Explain the structure and importance of Python packages	[L2][CO3]	**[5M]**
	b	Write a Python program to read a text file and count the number of words	[L1][CO3]	**[5M]**
8	**a**	Explain exception handling in file operations.	[L2][CO3]	**[5M]**
	b	Explain the concepts of class and object with an example	[L2][CO3]	**[5M]**
9	**a**	What is inheritance? Explain any two types with examples	[L2][CO3]	**[5M]**
	b	Explain REST architecture and its key principles	[L3][CO3]	**[5M]**
10		Describe the hardware architecture of Raspberry Pi 3. Explain its GPIO layout and connectivity features with a neat diagram	[L3][CO3]	**[10M]**
11	**a**	Write a Python program to blink an LED using Raspberry Pi GPIO	[L3][CO5]	**[5M]**
	b	Write short notes on SPI, I2C, and UART interfaces in Raspberry Pi	[L2][CO3]	**[5M]**

UNIT–IV
IoT Technologies, Standards, Tools & M2M Network

1	**a**	Define Internet of Things (IoT). Mention any two fundamental characteristics of IoT	[L1][CO4]	**[2M]**
	b	What is Bluetooth Low Energy (BLE)? State any one application of BLE	[L1][CO4]	**[2M]**
	c	Compare Wi-Fi and LoRa in terms of data rate and communication range	[L4][CO4]	**[2M]**
	d	What is LoRa technology? Mention any two advantages of LoRa for IoT applications.	[L1][CO4]	**[2M]**
	e	What is Machine-to-Machine (M2M) communication? Give one example	[L1][CO4]	**[2M]**
2	**a**	Explain the **fundamental characteristics of IoT** with suitable examples	[L2][CO4]	**[5M]**
	b	Write a short note on the **IoT Reference Model** and its different layers.	[L3][CO4]	**[5M]**
3	**a**	Compare **BLE and Wi-Fi** technologies used in IoT applications	[L4][CO4]	**[5M]**
	b	Describe the working principle of **LoRa communication** and mention its advantages	[L2][CO4]	**[5M]**
4		Discuss the **HTTP, MQTT, and CoAP protocols** in detail. Highlight their architecture, working, message formats, and use cases	[L3][CO4]	**[10M]**
5	**a**	Explain the term **M2M communication** with examples	[L2][CO4]	**[5M]**
	b	What are the basic components of an **IoT Communication Protocol Stack**?	[L2][CO4]	**[5M]**
6	**a**	Difference between M2M and IoT	[L4][CO4]	**[5M]**
	b	Write a short note on **3G/4G communication technologies** for IoT	[L1][CO4]	**[5M]**
7		Describe the **SDN architecture** in detail. Explain how SDN helps in IoT network management	[L2][CO4]	**[10M]**
8		Discuss the concept of **Network Function Virtualization (NFV)** and its advantages in IoT. Provide examples of virtualized network functions	[L2][CO4]	**[10M]**
9	**a**	Describe the role of **gateways** in IoT communication	[L2][CO4]	**[5M]**
	b	Differentiate between **device-to-device** and **device-to-cloud** communication	[L4][CO4]	**[5M]**
10	**a**	Write a short note on **IoT security requirements**	[L1][CO4]	**[5M]**
	b	Mention any **two practical applications** of LoRa and BLE each	[L1][CO5]	**[5M]**
11		Elaborate on the **key challenges in IoT communication technologies** such as latency, power efficiency, reliability, and security.	[L2][CO4]	**[10M]**

UNIT–V
IoT Platform, Cloud Computing Platform & Data Analytics for IoT Development

1	**a**	What is an IoT platform? Mention any two services provided by an IoT platform.	[L1][CO6]	**[2M]**
	b	What is IBM Watson IoT Platform? Write one key feature.	[L1][CO6]	**[2M]**
	c	Define API endpoint in the context of IoT platforms.	[L1][CO6]	**[2M]**
	d	What is Node-RED? Why is it suitable for IoT application development?	[L1][CO6]	**[2M]**
	e	What is data analytics? Mention one role of analytics in IoT systems.	[L1][CO6]	**[2M]**
2	**a**	Explain the architecture of an IoT platform with a neat block diagram..	[L2][CO6]	**[5M]**
	b	Describe the major components of IBM Internet of Things Platform.	[L2][CO6]	**[5M]**
3	**a**	Explain the role of cloud computing platforms in IoT development.	[L2][CO6]	**[5M]**
	b	Discuss device creation and registration process in an IoT platform	[L2][CO6]	**[5M]**
4	**a**	Explain how IoT devices transmit data to cloud platforms	[L2][CO6]	**[5M]**
	b	Explain the working of IBM Watson IoT Platform	[L2][CO6]	**[5M]**
5		Describe device creation, API endpoints, and data transmission mechanisms in IoT platforms	[L4][CO5]	**[10M]**
6	**a**	What is Node-RED? Explain its flow-based programming model	[L2][CO6]	**[5M]**
	b	Describe the architecture of Node-RED	[L2][CO6]	**[5M]**
7	**a**	Explain the steps involved in deploying an IoT application using Node-RED	[L2][CO5]	**[5M]**
	b	Define data analytics and explain its significance in IoT applications	[L2][CO6]	**[5M]**
8	**a**	Explain the basic architecture of Apache Hadoop	[L3][CO6]	**[5M]**
	b	Describe Hadoop Distributed File System (HDFS)	[L2][CO6]	**[5M]**
9		Compare Apache Hadoop, Apache Spark, and Apache Storm for IoT data processing	[L4][CO6]	**[10M]**
10	**a**	What is Apache Storm? Explain its importance in real-time data analytics	[L2][CO6]	**[5M]**
	b	Differentiate between batch processing and stream processing	[L4][CO6]	**[5M]**
11	**a**	Discuss the challenges in IoT data analytics	[L2][CO6]	**[5M]**
	b	Write short notes on cloud-based data analytics for IoT	[L2][CO6]	**[5M]**