SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ARTIFICIAL INTELLIGENCE

(Common to Department of IT)

QUESTION BANK

V SEMESTER

AD3561 EMBEDDED SYSTEMS AND IoT

Regulation – 2023

Academic Year 2025 – 2026 (Odd Semester)

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SUBJECT : AD3561 EMBEDDED SYSTEMS AND IoT

SEM/ YEAR : V / III

UNIT I - 8-BIT EMBEDDED PROCESSOR			
8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.			
PART-A			
Q. No.	**Questions**	**BTL**	**Competence**
1	Define microcontroller.	BTL1	Remembering
2	Compare microprocessor with microcontroller.	BTL2	Understanding
3	Which register has the SMOD bit, and what is its status when the 8051 is powered up?	BTL1	Remembering
4	Give the format of the register PSW of 8051 and name each of it.	BTL2	Understanding
5	Summarize on the operating mode 0 of 8051 serial ports.	BTL2	Understanding
6	Which register is used for serial programming in 8051?	BTL1	Remembering
7	Write a program to find the 2's complement using 8051.	BTL2	Understanding
8	List the 8051 interrupts with its priority.	BTL1	Remembering
9	How does 8051 differentiate between bit and byte addresses in its internal RAM?	BTL1	Remembering
10	Outline the features of 8051 microcontroller.	BTL2	Understanding
11	What is the significance of EA and PSEN pin in 8051 microcontroller?	BTL1	Remembering
12	Infer the advantages and disadvantages of parallel communication over serial communication in 8051.	BTL2	Understanding
13	Define baud rate of 8051.	BTL1	Remembering
14	Which port is used as multi-function port?	BTL1	Remembering
15	Compare the maskable and non-maskable interrupt.	BTL2	Understanding
16	Illustrate the CJNE instruction.	BTL2	Understanding
17	Show the pin diagram of 8051.	BTL2	Understanding
18	What are bit manipulation instructions? Give two examples.	BTL1	Remembering
19	Compare timer with counter.	BTL2	Understanding
20	State how baud rate is calculated for serial data transfer in mode 1.	BTL1	Remembering
21	Name the modes of timer in 8051.	BTL1	Remembering
22	How to program 8051 timers?	BTL1	Remembering
23	Give the format and list the function of the instruction DJNZ for 8051.	BTL2	Understanding
24	What do you mean by the interrupts?	BTL1	Remembering

PART B				
Q. No.	**Questions**		**BTL**	**Competence**
1	Explain the architecture of 8051 microcontroller in detail.	(16)	BTL4	Analyzing
2	(i) Distinguish between microprocessor and microcontroller. (ii) List the features of 8051 microcontroller.	(8) (8)	BTL4	Analyzing
3	Identify the functional blocks of 8051 microcontroller and explain.	(16)	BTL3	Applying
4	Illustrate the pin diagram of 8051 and explain the signals in detail.	(16)	BTL3	Applying
5	Examine the memory organization of 8051 with appropriate details.	(16)	BTL4	Analyzing
6	Assess the different modes of operation of Counter/Timer in 8051 with its associated registers.	(16)	BTL5	Evaluating
7	Inspect on instructions available in 8051 microcontroller and summarize on the mnemonics used to write an instruction.	(16)	BTL4	Analyzing
8	Demonstrate the serial communication in 8051, with its special function register.	(16)	BTL3	Applying
9	Categorize the instruction set of the 8051 microcontroller and explain with an example.	(16)	BTL4	Analyzing
10	Discuss the role of parallel I/O ports in 8051 with appropriate circuit diagram.	(16)	BTL6	Creating
11	Compare the serial communication with parallel communication.	(16)	BTL4	Analyzing
12	Explain the various interrupt handling methods with neat sketch.	(16)	BTL5	Evaluating
13	Show the internal RAM organization of 8051 and write a program to demonstrate a stack operation.	(16)	BTL3	Applying
14	Compile a program to generate a square wave using Timer 1 in 8051 microcontroller.	(16)	BTL6	Creating
15	Analyze the use of interrupts in 8051. Illustrate how are they prioritized and handled with an example.	(16)	BTL4	Analyzing
16	Write an assembly program for serial transmission of a character.	(16)	BTL6	Creating
17	Show the timing diagram of 8051 for the reading external data and code.	(16)	BTL3	Applying

UNIT II - EMBEDDED C PROGRAMMING

Priority Based Scheduling Policies - Memory and I/O Devices Interfacing – Programming Embedded Systems in C – Need for RTOS – Multiple Tasks and Processes – Context Switching.

PART A			
Q. No.	**Questions**	**BTL**	**Competence**
1	What is embedded C programing?	BTL1	Remembering
2	Define memory device interfacing.	BTL1	Remembering
3	Recall I/O device interfacing.	BTL2	Understanding
4	State the purpose of Watch dog.	BTL1	Remembering
5	Infer the advantages and limitations of priority based process scheduling.	BTL2	Understanding
6	Show how context switching is done in RTOS.	BTL2	Understanding
7	Outline the memory devices used in the design of embedded system.	BTL2	Understanding
8	How does priority scheduling improve multitask execution?	BTL1	Remembering
9	Illustrate the concept of multitasking.	BTL2	Understanding
10	Classify the types of memory components that are commonly used in embedded systems.	BTL2	Understanding
11	Define embedded programming.	BTL1	Remembering
12	Compare multiprocessing with multitasking.	BTL2	Understanding
13	List the applications of RTOS.	BTL1	Remembering
14	What do you mean by RTOS?	BTL1	Remembering
15	Relate multitasking with a real word example.	BTL2	Understanding
16	Summarize on variable scope in programming.	BTL2	Understanding

17	When RTOS necessary and when it is not necessary in the embedded system?	BTL1	Remembering
18	What is Variable Scope?	BTL1	Remembering
19	Outline the Arduino operators.	BTL2	Understanding
20	Define Sketch.	BTL1	Remembering
21	Classify the types of priority scheduling.	BTL2	Understanding
22	Compare the regular operating system with RTOS.	BTL1	Remembering
23	Mention the priority based scheduling algorithms for embedded systems.	BTL1	Remembering
24	What is priority inversion?	BTL1	Remembering

PART B

Q. No.	Questions		BTL	Competence
1	List the types of priority scheduling. Discuss the advantages and disadvantages in detail.	(16)	BTL4	Analyzing
2	Compare earlier deadline first scheduling with rate monotonic scheduling.	(16)	BTL4	Analyzing
3	Explain the earliest deadline first scheduling in detail.	(16)	BTL5	Evaluating
4	Evaluate the performance of rate monotonic scheduling.	(16)	BTL5	Evaluating
5	Illustrate the concept of context switching in RTOS with an example.	(16)	BTL3	Applying
6	Identify the need of RTOS with necessary illustration.	(16)	BTL3	Applying
7	Examine in detail, memory interfacing.	(16)	BTL4	Analyzing
8	Organize the components of the programmable peripheral interface (PPI) 8255 and explain with appropriate diagram.	(16)	BTL3	Applying
9	Show how the PPI 8255 is interfaced with the microcontroller 8051.	(16)	BTL3	Applying
10	Show the pin diagram of 8255 and explain the necessary details.	(16)	BTL3	Applying
11	Inspect the operating modes of 8255 in detail.	(16)	BTL4	Analyzing
12	Identify the steps for developing an Embedded C program with an example.	(16)	BTL3	Applying
13	Determine the role of Embedded C programming in building embedded systems for real world applications.	(16)	BTL5	Evaluating
14	Design an Embedded C program for your own choice of modern application.	(16)	BTL6	Analyzing
15	Distinguish between the multiprocessing and multitasking.	(16)	BTL4	Applying
16	Explain the working process of context switching and provide its state diagram.	(16)	BTL5	Evaluating
17	Illustrate the concept of priority inversion and explain how it can be avoided.	(16)	BTL3	Applying

UNIT III IoT AND ARDUINO PROGRAMMING

Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output from Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.

PART A

Q. No.	Questions	BTL	Competence
1	Show the logic design of IoT and describe its components.	BTL2	Remembering
2	Compare IoT devices with computers.	BTL2	Understanding
3	Outline the different types of Arduino.	BTL2	Understanding
4	Interpret the role of Python in Arduino programming.	BTL2	Understanding

5	Infer the benefits of Python.	BTL2	Understanding
6	Recall what is GND in GPIO.	BTL2	Understanding
7	State the significance of Raspbian OS.	BTL1	Remembering
8	Name the four protocols of IoT.	BTL1	Remembering
9	Why Linux OS used in Raspberry Pi ?	BTL1	Remembering
10	In what way Raspberry pi is better than Arduino?	BTL1	Remembering
11	Define IoT.	BTL1	Remembering
12	Infer the challenges faced by Internet of Things.	BTL2	Understanding
13	Summarize the characteristics of IoT.	BTL2	Understanding
14	Interpret the benefits of IoT.	BTL2	Understanding
15	What is LCD shield?	BTL1	Remembering
16	Classify the types of shields.	BTL2	Understanding
17	What is Arduino Uno Pinout - ICSP Header?	BTL1	Remembering
18	Define I2C.	BTL1	Remembering
19	Define Arduino Interrupt.	BTL1	Remembering
20	List any two common IoT configurations.	BTL1	Remembering
21	Illustrate the basic structure of an Arduino sketch.	BTL2	Understanding
22	Infer the purpose of the Arduino toolchain.	BTL2	Understanding
23	What are Arduino pins? List the types.	BTL1	Remembering
24	What is the role of Arduino shields in IoT applications?	BTL1	Remembering

PART B

Q. No.	Questions		BTL	Competence
1	Organize the technical building blocks of IoT and explain.	(16)	BTL3	Applying
2	Categorize the communication technologies of IoT.	(16)	BTL4	Analyzing
3	Model the physical design of IoT and explain .	(16)	BTL3	Applying
4	Explain the sensors and interfacing a sensor node using any embedded target boards like Raspberry Pi in detail.	(16)	BTL5	Evaluating
5	Determine the usage of Arduino shields. Explain how shields extend the functionality of Arduino boards with relevant examples.	(16)	BTL4	Analyzing
6	Compare the types of Arduino with its advantages, disadvantages and applications in detail.	(16)	BTL4	Analyzing
7	Assess the significance of Arduino in the development of IoT-based systems.	(16)	BTL5	Evaluating
8	Inspect the Arduino toolchain in detail. Explain how each part of the toolchain contributes to code development and deployment.	(16)	BTL4	Analyzing
9	Write an Arduino sketch to demonstrate reading input from a digital pin and providing output through an LED. Explain the logic used.	(16)	BTL6	Creating
10	Discover the basic components of an IoT system. Illustrate how each component contributes to the functioning of an IoT application.	(16)	BTL4	Analyzing
11	Illustrate the structure of an Arduino program (sketch). Describe the role of setup() and loop() functions with examples.	(16)	BTL3	Applying
12	List the challenges in integrating sensors and actuators with Arduino. Explain in detail, how can these challenges be addressed.	(16)	BTL4	Analyzing

13	Examine how sensors and actuators are integrated with Arduino in IoT systems. Provide a real-world example and code snippet to support your answer.	(16)	BTL4	Analyzing
14	Compare the different types of Arduino boards (e.g., Uno, Nano, Mega). Highlight their specifications and use-cases.	(16)	BTL5	Evaluating
15	Elaborate the concept of Arduino pins. Differentiate between digital, analog, and PWM pins with proper examples.	(16)	BTL6	Creating
16	Determine the process of uploading a sketch to an Arduino board including the steps from writing the code to seeing the output.	(16)	BTL5	Evaluating
17	Identify the role of Arduino in the IoT ecosystem. Explain how does it act as a bridge between the physical and digital world.	(16)	BTL3	Applying

UNIT IV IoT COMMUNICATION AND OPEN PLATFORMS

IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

PART A

Q. No.	Questions	BTL	Competence
1	Classify the IoT communication APIs.	BTL2	Understanding
2	What is meant by layered system?	BTL1	Remembering
3	Outline the applications of Bluetooth.	BTL2	Understanding
4	Compare Zigbee with Bluetooth.	BTL2	Understanding
5	Define NFC.	BTL1	Remembering
6	How Piconet is formulated?	BTL1	Remembering
7	Define Scatternet.	BTL1	Remembering
8	How does GPS function?	BTL1	Remembering
9	Demonstrate the usage of GSM/GPRS module.	BTL2	Understanding
10	Infer the significant components of mobile station in GSM.	BTL2	Understanding
11	List the common functions of mobile termination in GSM.	BTL1	Remembering
12	What is Mobile Switching Centre (MSC)?	BTL1	Remembering
13	Summarize the components of Home Location Register (HLR).	BTL2	Understanding
14	Infer the purpose of Visitor Location Register (VLR).	BTL2	Understanding
15	Define Equipment Identity Register (EIR).	BTL1	Remembering
16	Illustrate the function of SMS Gateway (SMS-G).	BTL2	Understanding
17	Interpret the operation of Base Station Controller (BSC).	BTL2	Understanding
18	Infer the role and function of Operation and Support Subsystem (OSS).	BTL2	Understanding
19	Define NOOBS.	BTL1	Remembering
20	Summarize on Raspberry Pi.	BTL2	Understanding
21	Recall the features of GSM and mention one IoT application using it.	BTL2	Understanding
22	Outline any two open-source IoT platforms.	BTL2	Understanding
23	What is GPIO in the context of Raspberry Pi?	BTL1	Remembering
24	Why cloud connectivity is important for IoT devices?	BTL1	Remembering

PART B

Q. No.	Questions		BTL	Competence
1	Explain GSM services and its architecture in detail.	(16)	BTL5	Evaluating
2	Examine the working of Bluetooth in IoT systems. Discuss its architecture, advantages, and limitations.	(16)	BTL4	Analyzing
3	Compare the various IoT communication protocols and explain with neat diagram.	(16)	BTL4	Analyzing
4	Discuss the architecture and components of an open platform like Raspberry Pi. Explain its role in building an IoT application.	(16)	BTL5	Evaluating

5	Analyze the features and functionalities of GPS in detail.	(16)	BTL4	Analyzing
6	Illustrate how signals are transmitted using GPIO.	(16)	BTL3	Applying
7	Compare Raspberry Pi with Arduino in terms of architecture, capabilities, and use in IoT systems.	(16)	BTL5	Evaluating
8	Model the organization of GPIO pins in Raspberry Pi. Explain how are they used to send and receive signals.	(16)	BTL3	Applying
9	Compare the features and applications of Bluetooth with Wi-Fi.	(16)	BTL4	Analyzing
10	Infer how cloud services (e.g., AWS IoT, Google Cloud IoT) are used in IoT systems. Discuss integration with Raspberry Pi.	(16)	BTL4	Analyzing
11	Compare the performance of Bluetooth, ZigBee, and Wi-Fi for different IoT scenarios.	(16)	BTL5	Evaluating
12	Identify the role of GSM technology in IoT. Provide an example of an IoT application using GSM modules.	(16)	BTL3	Applying
13	Write a Python program for Raspberry Pi to read input from a GPIO pin and turn on an LED based on the input. Explain the logic.	(16)	BTL6	Creating
14	Assess the various APIs used in IoT communication. Explain how do they facilitate data exchange between devices.	(16)	BTL5	Evaluating
15	Discuss how WiFi is used for IoT connectivity. Explain with examples of common WiFi-enabled IoT devices.	(16)	BTL6	Creating
16	Elaborate on programming Raspberry Pi for IoT applications with necessary details and diagrams.	(16)	BTL6	Creating
17	Explain the process of interfacing sensors and actuators with Raspberry Pi including the circuit design and code snippets.	(16)	BTL5	Evaluating

UNIT V APPLICATIONS DEVELOPMENT

Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare.

PART A

Q. No.	Questions	BTL	Competence
1	What is an embedded system design?	BTL1	Remembering
2	Outline the elements of embedded systems.	BTL2	Understanding
3	Classify the types of embedded systems.	BTL2	Understanding
4	Infer the challenges in embedded system design.	BTL2	Understanding
5	Give the examples of embedded system design.	BTL2	Understanding
6	Interpret the role of sensors.	BTL2	Understanding
7	Define Application Specific Integrated Circuit (ASIC).	BTL1	Remembering
8	Show the significance of embedded system processors.	BTL2	Understanding
9	List the various sensors used in Smart City development.	BTL1	Remembering
10	Classify the types of general purpose processor.	BTL2	Understanding
11	Illustrate the three main components of embedded systems.	BTL2	Understanding
12	Outline the advantages of embedded system.	BTL2	Understanding
13	List the disadvantages of embedded system.	BTL1	Remembering
14	Define Industrial Automation.	BTL1	Remembering
15	Recall how IoT is playing important role in industrial automation.	BTL2	Understanding
16	Tell the applications of IoT in Healthcare.	BTL1	Remembering
17	List the applications of IoT in Smart Retail.	BTL1	Remembering
18	Name the applications of IoT in Smart Supply Chain.	BTL1	Remembering
19	Find the applications of IoT in Smart Grid.	BTL1	Remembering
20	State the applications of IoT in Smart Farming.	BTL1	Remembering
21	What is MQTT Protocol?	BTL1	Remembering
22	Define Signal Conditioning Unit (SCU).	BTL1	Remembering

23	List the various sensors used in Health care application development.	BTL1	Remembering
24	What are the function and applications of motion sensor?	BTL1	Remembering

PART B

Q. No.	Questions		BTL	Competence
1	Identify the various components used to design the embedded systems applications and explain	(16)	BTL3	Applying
2	Examine the various components used in the development of IoT applications with necessary illustration.	(16)	BTL4	Analyzing
3	Build a program for home automation and explain in detail.	(16)	BTL3	Applying
4	Construct a program for smart agriculture and explain with relevant diagrams.	(16)	BTL3	Applying
5	Develop a program to illustrate smart cities with appropriate diagram.	(16)	BTL3	Applying
6	Design a program to smart healthcare and explain its importance with necessary diagram.	(16)	BTL6	Creating
7	Illustrate the role of sensors in application development of industrial automation.	(16)	BTL3	Applying
8	Compose an IoT application to help disable or aged person those who are staying alone in home.	(16)	BTL6	Creating
9	Discover a complete architecture diagram to automate the home security system, identify the appropriate sensors and explain.	(16)	BTL4	Analyzing
10	Assess how face detection and motion sensor can be used in designing a campus security system and justify your answer.	(16)	BTL5	Evaluating
11	Distinguish between embedded application development and IoT application development.	(16)	BTL4	Analyzing
12	Decide an architecture diagram to enable home automation using various sensors through smart phone.	(16)	BTL5	Evaluating
13	Explain how the various sensors can be used to control and monitor the precision agriculture through IoT.	(16)	BTL5	Evaluating
14	Justify the following statement: “Sometimes the sensors are not used in mission critical applications”.	(16)	BTL6	Creating
15	List the appropriate sensors and components used for the development of smart street light automation system and explain.	(16)	BTL4	Analyzing
16	Infer the complete architecture for monitoring in and out patients of health care system.	(16)	BTL4	Analyzing
17	Design an architecture for automatic vehicle control system by identifying necessary sensors and explain how it works in detail.	(16)	BTL6	Creating