Course: (Code)	IOT & Embedded Computing (CS344AI)		Semester :	4th semester
Date : June 2024	Duration : 90 Minutes		Staff :	KB/MSS/SDV/MH
Name:	USN :		Section :	A/B/C/D/CD/CY

PART B

1	With neat Block diagram explain the LPC2148 architecture. List the Peripherals associated and their corresponding applications.	10 6-8	L2	CO2
2	a) List the differences between the General-Purpose computing systems and Embedded systems. b) Explain the Operating Modes of ARM using the Register Architecture	10 10	L3	CO2
3	Interface 5-digit seven segment display to LPC 2148 and write an embedded C program to display the moving string "IOT BOARD".	10 8-10	L3	CO3
4	Design a Bank locker system as per the specifications given below by clearly indicating the interface diagram and embedded C code. Requirements: a) Use LPC 2148 Microcontroller and suitable interfacing components. b) Enter a 4digit key to open the locker, If the key entered was correct open the locker door, driven by stepper motor. c) Provide a Key, to close the door. Make suitable assumptions.	10 0	L4	CO3
5	Explain the working of DAC module of LPC 2148 Microcontroller, and indicate the Resolution, input and output ranges. Write an embedded C program to generate triangular, staircase and rectangular waveforms.	10 0-3	L3	CO3

Course Outcomes: After completing the course, the students will be able to:-

1	Apply Embedded System and IoT fundamentals and formulate sustainable societal relevant cost effective solutions.
2	Demonstrate the development of software programs using Embedded C, using Microcontrollers and different sensors and peripherals to build embedded system applications.
	Design smart systems using various I/O peripherals, Sensors, embedded protocols like UART,I2C,SPI using modern tools like Keil IDE software for various domains like Healthcare, automation, agriculture, smart cities and others.
	Indulge in developing Novel multi-disciplinary IoT projects using prototype boards, with effective oral & written communication skills and working in teams.
	Engage in Lifelong Learning by investigating and executing real world societal problems using engineering tools – Cross compilers, debuggers and simulators, emerging processor and controller-based hardware platforms, IOT cloud infrastructure & protocols.

	L1	L2	L3	L4	L5	L6	COS	CO1	CO2	CO3	CO4
BT LEVELS		L1	L2	L3	L4	L5 **	L6 **	COS **	CO1 **	CO2 20	CO3 30	CO4 **
MARKS	**	10	30	10							

Date : July 2024	Duration:120 minutes	Max.Marks:(10+50)=60 Marks	Staff : KB, SDV, MSS,
USN :	Name :		Section : A/B/C/D/CD/C

NOTE: *Answer all the questions from Part-A (10 M) and Part-B (50 M)*

Sl.no	PART - A	Marks	BT	C
1	Indicate the value to be loaded into match Register MR0, so that timer counter T0TC reaches the MR0 value after 5 milliseconds. Assume the PCLK = 10MHz, CCLK=40MHz, T0TC=0, Pre-scaler Register=0 (Show the calculations)	2	L3	CO

2	Calculate the delay produced by the following program run on LPC2148. Given PCLK = 15MHz. Write the answer in milli-seconds. Justify your answer.
	
	``c
	void delay(void)
	{
	T0MCR = 0X04;
	T0TC = 0X00;
	T0MR0 = 75000;
	T0TCR = 0X01;
	while(T0TC != T0MR0);
	T0TCR = 0X02;
	}
	``
		2	L3	CO

3	Given PCLK=15MHz, Required baud rate=9600, Compute the values of DLM:DLL. (Assume DivVal=0, MulVal=1). Show the calculations	2	L3	
4	What are the different types of communication models used in IoT.	2	L2	
5	List any four most commonly used sensors in IoT and mention any two applications of PWM in IoT	2	L2	

Sl.no	PART - B	Marks	BT	*CO
1a.	Generate the 200KHz, 25% duty cycle waveform using LPC 2148 PWM channel. Assume PCLK = 15MHz. Make suitable assumptions, and explain clearly the calculations and the working of the program.	5	L3	CO3
1b.	Generate the 10KHz square waveform using LPC 2148 GPIO pin P0.1. Use timers to calculate the timings and assume PCLK = 60MHz. Explain the working of the program.	5	L3	CO3
2a.	Design an activity LED (one which is blinking once in 10 seconds to indicate the system/product is working) using interrupts and timers, with suitable comments.	5	L3	CO3
2b	Discuss the Features and Applications of serial protocols I2C and SPI.	5	L2	C03
3a	Define IoT and Explain the functional blocks of IoT with the help of neat block diagram.	5	L2	CO3
3b.	Suggest (With brief description) any one-use case of IOT pertaining to following domains: Energy, Retail, Logistics, Agriculture, Cities.	5	L4	CO4
4a.	Design an IOT Level 2 deployment application for weather monitoring and Device control in the house using ESP32 and Thing speak cloud platform, with suitable block diagram, interfacing, flowcharts and brief description. The proposed system consists of single node that monitors the room temperature and humidity using DHT 11 sensor, and based on the temperature / humidity, device(fan) should be turned on using a Relay. The controller also sends the sensor data to the cloud, where it will be displayed on the dash board.	5	L6	CO4
4b.	Design an IOT Leve2 deployment application for Smart Parking using RasberryPie with IR sensors and Cloud with Mobile Application to show the parking slots status. Draw the block diagram, interfacing, flowchart and brief description.	5	L6	CO4
5	Interface LDR and LED bulb to LPC 2148 and write an embedded C program to read the data from LDR and suitably turn on/off the LED bulb and also send the suitable message to computer using UART interface. Clearly show the connections between LPC 2148 and Computer Serial Port and explain the UART initialization steps, clearly showing the registers used and the baud rate calculations.	10	L3	CO3

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BT LEVELS	L1	L2	L3	L4	L5	L6	COS	CO1	CO2	CO3	CO4
MARKS		14	31	5		10				41	19

Course & Code	IOT and Embedded Computing (CS344AI)		Semester:	4th Sem BE
Date : Aug 2024	Duration:120 minutes	Max.Marks:(10+50)=60 Marks	Staff : KB, SDV, MSS, MH	
USN :	Name :		Section : A/B/C/D/CD/CY	

NOTE: *Answer all the questions from Part-A (10 M) and Part-B (50 M)*

Sl.no	PART - A	Marks	BT	CO
1	Suggest any one application of Level 5 and Level 6 IOT deployment.	2	L3	CO5
2	Describe an Example of IoT service that uses publish-subscribe communication model. Name the popular application layer protocol for publish-subscribe model used in resource constraint IOT systems.	2	L3	CO5
3	Name the pins provided by RasberryPie to support I2C and SPI interfaces.	2	L2	CO4
4	Evaluate the following statements and indicate whether they are true/false. a) Von Neumann Architecture shares common memory for Data and Instructions b) Harvard Architecture has separate physical memories for Data and Instructions	2	L3	CO1
5	Consider a four-bit ALU which does four bits arithmetic. When the following four-bit numbers are added, what is the status of NZCV flags? 1101 + 1011	2	L4	CO2

Sl.no	PART - B	Marks	BT	*CO
1	Draw the deployment design of the weather monitoring IOT system. Further, show the mapping of IOT Level to Functional Groups for the weather monitoring IoT system.	5	L3	CO
2	Write the programs to perform the following: (draw interface diagrams) - Interface one LED to GPIO 18, and program for blinking the LED (use RasberryPie and phython)	5	L3	CO

	- Interface one LDR to D36 and LED to D2, and make the LED on/off based on Light Intensity (use ESP32 and embedded C)				

3	The purpose of the home intrusion detection system is to detect intrusion using sensors (PIR sensor and Door sensor). Design Home Intrusion Detection system using RPie/ESP32 with PIR motion sensor for motion detection and door sensor for detecting opening / closing of the door (for one room). Draw the following (no explanation required)
	   - Process Specification
	   - Domain model
	   - Deployment design
	   - Functional & Operational View specifications
		10	L4	CO5	

4	a) With a neat diagram explain the architecture of ARM Microcontroller. b) With the neat diagram briefly describe operating modes and register organization of ARM ISA. Mention the use of following Registers: R13,R14,R15,CPSR and SPSR.	5 5	L2 L3	CO1 CO2	
5	a) Explain how embedded system are classified. b) Differentiate between RISC and CISC architecture.	5 5	L3 L2	C C	

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