Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VII (New) EXAMINATION – WINTER 2019

Subject Code: 2171005 Date: 26/11/2019

Subject Name: Embedded Systems

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define the embedded system and give classification of it.	**03**
	(b)	Explain UART protocol for serial communication.	**04**
	(c)	Explain various components of embedded system hardware and give example of any one embedded system with necessary diagram.	**07**
Q.2	**(a)**	Define the following term a. RTC b. Watchdog Timer	**03**
	(b)	Explain interrupt latency.	**04**
	(c)	Explain I^2C bus communication protocol with necessary diagram.	**07**
		OR	
	(c)	Explain various features of IrDA and Bluetooth protocol with necessary diagram for wireless and mobile system.	**07**
Q.3	**(a)**	Explain the steps involved during the context switching.	**03**
	(b)	Define the task and explain the various states of task with necessary diagram.	**04**
	(c)	Explain various interrupt service (handling) mechanism used in embedded system.	**07**
		OR	
Q.3	**(a)**	Explain different types of interrupt sources.	**03**
	(b)	Explain the feature of device driver and give classification of it.	**04**
	(c)	Explain Direct Memory Access controller with necessary diagram.	**07**
Q.4	**(a)**	Describe the various uses of RTOS in embedded system.	**03**
	(b)	Define semaphore and discussed the problem that can be arise while using semaphores.	**04**
	(c)	Write short notes on socket functions.	**07**
		OR	
Q.4	**(a)**	Define the following term a. Binary semaphore b. Counting semaphore c. P and V semaphore	**03**
	(b)	Explain priority inversion problem and deadlock situation in shared data approach.	**04**
	(c)	Explain Preemptive scheduling model of RTOS.	**07**
Q.5	**(a)**	Write the difference between Hard Real Time and Soft Real Time System with an example.	**03**
	(b)	Explain the multiplexing scheme in MSP430 processor for the port pins.	**04**
	(c)	Explain cooperative scheduling model of RTOS.	**07**
		OR	
Q.5	**(a)**	Describe the clock system of MSP430 processor	**03**
	(b)	Describe the methods of saving and optimizing power needs in embedded system.	**04**
	(c)	Explain MSP430 RISC CPU architecture.	**07**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2171005 Date:14/05/2019

Subject Name:Embedded Systems

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Enlist the criteria for choosing CPU for any embedded application.	**03**
	(b)	What is RTOS ? Describe types of RTOS with two examples.	**04**
	(c)	Describe I2C and CAN bus protocol.	**07**
Q.2	**(a)**	Describe advantage and disadvantage of serial and parallel communication protocol.	**03**
	(b)	Describe Watchdog timer and RTC needed for embedded application.	**04**
	(c)	Describe Wi-Fi and Zigbee protocols. Discuss the application areas for both the protocols.	**07**
		OR	
	(c)	Explain classification of embedded system with examples.	**07**
Q.3	**(a)**	Describe concept of interrupt service thread.	**03**
	(b)	Describe interrupt latency and deadline with example.	**04**
	(c)	Describe dead-lock condition. Write pseudo code for deadlock utilizing mutex M1 and M2 shared between two processes P1 and P2.	**07**
		OR	
Q.3	**(a)**	Describe why atomic operation is needed in some of coding part of	**03**
	(b)	Describe priority inversion with example. How to deal with such condition.	**04**
	(c)	Describe counting and binary semaphore as a resource key.	**07**
Q.4	**(a)**	Differentiate : Function and ISR	**03**
	(b)	Describe co-operative and pre-emptive scheduling.	**04**
	(c)	Why Inter Process Communication is needed in multi-process system ? Describe mailbox, lock and spin-lock methods for IPC.	**07**
		OR	
Q.4	**(a)**	What is Process Control Block? What are the fields included in PCB ?	**03**
	(b)	Describe task/services to be performed by OS.	**04**
	(c)	Describe memory and file management in RTOS.	**07**
Q.5	**(a)**	Describe low power modes of MSP430.	**03**
	(b)	Describe MSP430 GPIO registers associated with I/O port.	**04**
	(c)	Describe MSP430 USCI module with different registers and operation.	**07**
		OR	
Q.5	**(a)**	Describe POR, PUC and BOR for MSP430.	**03**
	(b)	Describe clocking system of MSP430.	**04**
	(c)	Sketch interfacing diagram to interface common anode seven-segment display with Port 1 and 8 push button switches with Port 2 with MSP430. When SW1(P2.0) pressed and it should display “1”. Write C language program to display pressed switch number on seven segment display.	**07**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2171005 **Date: 19/11/2018**

Subject Name: Embedded Systems

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	List out the advantages of ASIC based Embedded Systems.	**03**
	(b)	In absence of Digital to Analog Convertor (DAC), how can you use Pulse Width Modulator for DAC operation?	**04**
	(c)	Explain different approaches for designing and implementing the embedded software.	**07**
Q.2	**(a)**	How Watchdog timer is used in Embedded System design?	**03**
	(b)	Explain the significant differences between Bluetooth and Zigbee protocol.	**04**
	(c)	Explain the differences between programmed I/O, interrupt and direct memory access approaches.	**07**
		OR	
	(c)	What is Device driver? Explain the role of Interrupt in Device driver programming.	**07**
Q.3	**(a)**	Define Interrupt Service Thread with its use in RTOS based system design.	**03**
	(b)	How semaphore helps in handling shared data problems?	**04**
	(c)	Explain the role of TCB in task switching.	**07**
		OR	
Q.3	**(a)**	What will happen if all the tasks are in Wait state? How RTOS will handle such situation?	**03**
	(b)	Describe performance matrices in RTOS based application.	**04**
	(c)	Describe the Timer functions supported in RTOS.	**07**
Q.4	**(a)**	List out significant differences between a soft real time system and a hard real time system.	**03**
	(b)	Describe Deadlock with an example.	**04**
	(c)	Describe the mailbox functions supported in Real Time Operating System.	**07**
		OR	
Q.4	**(a)**	Under which circumstances a task is brought to Wait state?	**03**
	(b)	What are the differences between a function and a task?	**04**
	(c)	Explain following scheduling policies with their differences. (1) Earliest Deadline First (2) Rate Monotonic Scheduler	**07**
Q.5	**(a)**	What are the significant features associated with GPIO in MSP430?	**03**
	(b)	Explain the benefits of using DCO over Crystal in MSP430 based system.	**04**
	(c)	Describe the Watchdog timer operation in MSP430.	**07**
		OR	
Q.5	**(a)**	How MSP430 processor is compiler friendly?	**03**
	(b)	Explain Pin Multiplexing in MSP430.	**04**
	(c)	Describe the Timer operation in MSP430 in association with generation of PWM wave.	**07**

****

Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2171005 Date:01/05/2018

Subject Name:Embedded Systems

Time:02.30 PM to 05.00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks**

			MARKS
Q.1	**(a)**	Enlist hardware units of an embedded system.	**03**
	(b)	Classify Embedded System.	**04**
	(c)	Describe the components present on SoC for the design of an embedded system.	**07**
Q.2	**(a)**	Explain Watchdog timer.	**03**
	(b)	Explain Serial Bus Communication Protocols.	**04**
	(c)	Describe the features associated with Bluetooth and Zigbee Protocols used in wireless and mobile systems.	**07**
		OR	
	(c)	Compare serial and parallel communication. Explain the buses used for serial communication.	**07**
Q.3	**(a)**	Explain difference between level-triggered and edge-triggered interrupts.	**03**
	(b)	Enlist IO port types.	**04**
	(c)	Write short note on DMA controller.	**07**
		OR	
Q.3	**(a)**	Explain interrupt latency.	**03**
	(b)	Explain ISR concept in interrupt.	**04**
	(c)	Write short note on Device Driver.	**07**
Q.4	**(a)**	Explain the differences between Hard Real Time and Soft Real Time System.	**03**
	(b)	Explain Memory management service provided by RTOS.	**04**
	(c)	Explain a Timer module of MSP430 with various modes of operation associated with it.	**07**
		OR	
Q.4	**(a)**	Explain concept of Semaphores.	**03**
	(b)	Explain the importance of a processor and its architecture in Embedded System Design.	**04**
	(c)	What is the significance of Mailbox in RTOS? Describe the functions provided by RTOS in association with Mailbox.	**07**
Q.5	**(a)**	Enlist service provided by RTOS.	**03**
	(b)	Enlist RTOS task scheduling models.	**04**
	(c)	Write short note on basic architecture of MSP430.	**07**
		OR	
Q.5	**(a)**	Describe the clock system of MSP430 processor.	**03**
	(b)	Explain the multiplexing scheme in MSP430 processor for the port pins.	**04**
	(c)	Explain the use of timer for generating Pulse Width Modulated Waveform using MSP430.	**07**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2017

Subject Code: 2171005 Date: 07/11/2017

Subject Name: Embedded Systems

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Explain the importance of a processor and its architecture in Embedded System Design.	**03**
	(b)	Explain the importance of power dissipation and process deadline as design metrics in embedded system.	**04**
	(c)	Describe the components present on SoC for the design of an embedded system.	**07**
Q.2	**(a)**	Explain SPI bus protocol to establish serial communication between a processor and a device.	**03**
	(b)	Define Interrupt Latency and Interrupt Service Deadline. Describe the parameters that govern their values.	**04**
	(c)	Describe the importance of timer and watchdog timer individually in system design.	**07**
		OR	
	(c)	Describe the features associated with Bluetooth and Zigbee protocols used in wireless and mobile systems. How will you select appropriate protocol in application development?	**07**
Q.3	**(a)**	Describe the states in which a task remains during its life cycle.	**03**
	(b)	Explain the requirement of Semaphore in RTOS based design along with its applications.	**04**
	(c)	Describe the features of Message Queue and Mailbox along with differences between them.	**07**
		OR	
Q.3	**(a)**	Describe context switching with importance of timer in round robin scheduling algorithm.	**03**
	(b)	What do you understand by Interrupt Service Thread? Explain its usage with an example in RTOS based systems.	**04**
	(c)	Explain the reasons for Priority Inversion along with solution for it.	**07**
Q.4	**(a)**	Explain the differences between Preemptive and Non-Preemptive scheduling policies.	**03**
	(b)	Describe the requirement of Direct Memory Access (DMA) based data transfer in Device driver programming.	**04**
	(c)	What do you understand by Event in RTOS based system? Describe Event management functions in RTOS.	**07**
		OR	
Q.4	**(a)**	Describe the differences between Hard Real Time and Soft Real Time System with an example of each one.	**03**
	(b)	What are the features essential in a processor to investigate before using an RTOS for application design?	**04**

	(c)	Describe the significance of File and I/O management along with supported functions in RTOS.	**07**
Q.5	**(a)**	MSP430 is having an orthogonal CPU architecture supported with RISC features. – Justify the statement.	**03**
	(b)	Describe the four sources of clock in MSP430 processor.	**04**
	(c)	Explain Watchdog timer in MSP430 with all the modes supported. How can you generate a delay of 32msec with watchdog timer?	**07**

OR

Q.5	**(a)**	Explain the special features associated with GPIO port pins in MSP430 other than simple digital input output port pin characteristics.	**03**
	(b)	Describe the interrupt feature associated with Timer in MSP430.	**04**
	(c)	Explain the use of timer for generating Pulse Width Modulated waveform using MSP430.	**07**

****

Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2171005 **Date: 02/05/2017**

Subject Name: Embedded Systems

Time: 02.30 PM to 05.00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Describe various processor architectures and their applications in several domains of embedded system design.	**07**
	(b)	Explain the requirements of Software Interrupts (SWI) in software part of an Embedded System.	**07**
Q.2	**(a)**	What is a device driver? What are its requirements? Describe the information required for writing a device driver.	**07**
	(b)	Describe the features associated with several ARM Buses.	**07**
		OR	
	(b)	Describe the features associated with Bluetooth and Zigbee protocols. Discuss the application areas for both the protocols.	**07**
Q.3	**(a)**	State the differences between a Task, a Function and an Interrupt Service Routine.	**07**
	(b)	What is Multithreading? Explain the concept of Multithreading in Real Time Operating System with the help of an application.	**07**
		OR	
Q.3	**(a)**	What is Semaphore? Explain where Semaphore can be utilized? Describe the functions provided by RTOS to utilize it.	**07**
	(b)	What is the significance of Mailbox in RTOS? Describe the functions provided by RTOS in association with Mailbox.	**07**
Q.4	**(a)**	Describe the characteristics associated with Earliest Deadline First Scheduler stating its merits and demerits.	**07**
	(b)	Explain the Process Management in RTOS along with describing the role of a Timer and Task Control Block.	**07**
		OR	
Q.4	**(a)**	Describe Memory management services provided by RTOS.	**07**
	(b)	How can an interrupt be served in an RTOS environment where the interrupt is to be first handled by the RTOS?	**07**
Q.5	**(a)**	Explain a Timer module of MSP430 with various modes of operation associated with it.	**07**
	(b)	It is required to accept an incoming signal on GPIO pin P1.0 as an interrupt. Write a 'C' program utilizing an interrupt service routine to count number of rising edges on Port pin P1.0.	**07**
		OR	
Q.5	**(a)**	Answer the following questions regarding MSP430 processor. (i) Describe the clock system of MSP430 processor. (ii) Explain the multiplexing scheme in MSP430 processor for the port pins.	**07**

(b) It is required to interface three seven segment LED modules with an MSP430 processor. Draw the interfacing for it and write a 'C' program utilizing timer for refreshing the seven segment LEDs at a rate of 1 KHz to display a three digit value '178' stored in a variable 'x'. **07**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) • EXAMINATION – WINTER 2016

Subject Code:2171005 Date:21/11/2016

Subject Name:Embedded Systems

Time:10.30 AM to 1.00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define embedded systems. Explain the hardware units of an embedded system.	**07**
	(b)	Describe an embedded processor as (i) GPP (ii) ASIP (iii) Single purpose processor.	**07**
Q.2	**(a)**	Differentiate serial and parallel communication. Explain the buses used for serial communication.	**07**
	(b)	Illustrate the importance of watchdog timer and real time clock in embedded systems.	**07**
		OR	
	(b)	List and explain the protocols used for wireless and mobile system communication.	**07**
Q.3	**(a)**	Elaborate the concept of interrupt service routine.	**07**
	(b)	What is DMA? Using diagram show the operation of a DMA controller.	**07**
		OR	
Q.3	**(a)**	Write a brief note on device driver, its functions and programming.	**07**
	(b)	Discuss and compare process, task and thread.	**07**
Q.4	**(a)**	What is meant by P and V semaphores? Discuss semaphore as event signaling variable.	**07**
	(b)	Discuss shared data problems and give solutions to such problems.	**07**
		OR	
Q.4	**(a)**	Explain device, file and I/O management in RTOS.	**07**
	(b)	Give advantages, disadvantages and uses of mailbox, pipe and socket functions in interprocess communication.	**07**
Q.5	**(a)**	Name all the RTOS task scheduling models. Describe any one in detail.	**07**
	(b)	What is RTOS? Enlist the goals and services provided by RTOS.	**07**
		OR	
Q.5	**(a)**	Draw and explain the basic architecture and block diagram of MSP430.	**07**
	(b)	Explain the clocking system of MSP430.	**07**

****