Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Embedded Systems **Semester: I**

Program: M. Tech. (Robotics Engineering) **Time: 03 hrs.**

Course Code: ECEG7044 **Max. Marks: 100**

Instructions: Attempt all the questions

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Write an ATmega32 assembly language/ embedded C program to bring in a byte of data serially through pin 7 of PORT A and save it in R20 register. The byte comes in with the LSB first.	**4**	**CO1**
Q 2	Write an ATmega32 assembly language/ embedded C program to find the smallest number in a data array.	**4**	**CO1**
Q 3	What is the role of Timers in Atmega32 microcontroller and outline the significance of the following registers of Timers: (a) TCNTn (b) TOVn (c) TCCRn (d) OCRn	**4**	**CO2**
Q 4	What do you understand by IoT? List the main reason why IoT is widely being used in the industrial automation.	**4**	**CO3**
Q 5	Define and explain the different states of task in RTOS with state transition diagram.	**4**	**CO4**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	(a) A switch is connected to pin PB2 of ATmega32 microcontroller. Write an assembly language program to check the status of Switch and perform the following: (i) If Switch = 0, send the letter 'N' to PORTD (ii) If Switch = 1, send the letter 'Y' to PORTD (b) Write a C language program for ATmega 32 microcontroller to find the number of 1s in a given byte.	**6+4**	**CO1**
Q 7	Differentiate interrupt and polling. What are the different sources of interrupts in Atmega32? Assume that the INT0 pin is connected to a switch that is normally high. Write an assembly language/ embedded C program to toggle PORTC.3 whenever INT0 pin goes low. **OR**	**10**	**CO2**

	Design a real-time temperature monitoring system by interfacing LM35 with an Atmega32 microcontroller. Draw the complete flowchart along with assembly language/ embedded C code to read the sensor and display it on PORT D.		
Q 8	Explain the following with respect to IoT with suitable examples: (a) HIP (Host Identity Protocol) (b) Multimedia Access (c) Ubiquitous Networking (b) Cloud Computing	**10**	**CO3**
Q 9	What do you understand by scheduling in RTOS. Explain different scheduling techniques used for kernel interaction.	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q 10	(a) An Atmega32 microcontroller is interfaced with stepper motor. Four leads of stator winding of stepper motor are controlled by the four bits of the Atmega32 port (PB0-PB3). Write an assembly language/ embedded C program to rotate the stepper motor continuously in anticlockwise direction. (b) Explain successive approximation Analog to Digital converter with suitable diagram. Write an Atmega32 assembly language/ embedded C program to get the data from channel 0 of ADC and display the result on PORT C and PORT D forever. **OR** (a) An ATmega32/ARM microcontroller is interfaced with USART. Write an assembly language/ embedded C program to transfer the letter "G" serially at 9600 baud, continuously. Assume XTAL = 8 MHz. (b) The data pins of an LCD are connected to PORT A. The information is latched into the LCD whenever its Enable pin goes from HIGH to LOW. The enable pin is connected to pin 5 of PORT B (6th Pin). Write an embedded C program to send **"ATMEGA"** to this LCD.	**20**	**CO1**
Q 11	Design an IoT-based smart health monitoring system along with their technical description. Draw a detailed architecture/block diagram of the complete system.	**20**	**CO2**