Name: **Enrolment No:**	

UPES

End Semester Examination, December 2023

Course: Embedded Systems and IoT **Semester : V**

Program: B.Tech (Electronics and Communication Engineering) **Time : 03 hrs.**

Course Code: ECEG3061 **Max. Marks: 100**

Instructions: Attend All the sections

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Distinguish between CISC and RISC	**4**	**CO1**
Q 2	Illustrate the challenges in embedded systems	**4**	**CO1**
Q 3	Discuss the general architecture of a microcontroller	**4**	**CO1**
Q 4	Determine the value of the register after the execution of following instructions: LDI R20,0x78 LSR R20 ROR R20	**4**	**CO2**
Q 5	Evaluate the register values when the following instructions are executed LDI R22,0x54 ASR R22 COM R22	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Consider the following instructions executed in AVR ATmega32 microcontroller: (a) ADIW R24:R25, 5 Assume R24=255 and R25=0. Compute the values of R24, R25 and C after execution. (b) ANDI R16,0xF0 Assume R16=0x07. Compute R16 value after execution (c) LDI R0, 0x4A COM R0	**10**	**CO2**

	Compute the values of R0 after execution. (d) SBIC PINC, 1 MUL R0,R1 Justify the conditions for which the instruction MUL R0,R1 will be executed. (e) CPI R15,5 BRLT NEGATIVE CLR TEMP RJMP NEXT NEGATIVE: LDI TEMP,0xFF Assume R15=3. Examine whether the instruction after the branch instruction will be executed and justify. (OR) Consider the following instructions executed in ARM7 LPC2148 microcontroller: (a) MVN R0, R2 Assume R0=5 and R2=8. Compute the values of R0 and R2 after execution. (b) MOV R1, R3, LSL#2 Assume R3=0x00000030. Compute R1 and R3 values after execution (c) MOV R4, R5, ROR#4 Assume R5=0x00000031. Compute R4 and R5 values after execution. (d) LDR R6, [R7, #4] Assume R6=0x00000000, R7=0x00009000, mem32[0x00090000] = 0x01010101 and mem32[0x00009004] = 0x02020202. Compute the values of R6 and R7 after execution. (e) SWP R0, R1, [R2] Assume mem32[0x9000] = 0x12345678, R0 = 0x00000000, R1 = 0x11112222 and R2 = 0x00009000. Compute the values of R0, R1 and R2 along with mem32[0x9000] after execution.		
Q 7	Execute Timer1 program in ATMega32 microcontroller to generate square wave of 125 Hz frequency on pin PORTA.3 with normal mode and prescaler value as 1024. Assume XTAL = 8MHz	**10**	**CO2**

Q 8	Demonstrate the Wireless Hart Communication protocol	**10**	**CO3**
Q 9	Illustrate RTOS architecture	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q 10	(a) Explore the ARM LPC2148 microcontroller architecture along with the Pin diagram. (b) Elucidate the interfacing of DC stepper motor in the half step operation mode with ARM LPC2148 microcontroller. Utilize embedded C programming.	**20**	**CO2**
Q 11	(a) Analyze the LCD interfacing with AVR ATMega32 Microcontroller and execute this interfacing using assembly language programming. (b) Analyze the solid-state relay interfacing with AVR ATMega32 microcontroller and execute using assembly language programming. Display the results on PORTA. (OR) (a) Analyze the ADC and DAC interfacing with ARM LPC2148 microcontroller and execute the interfacing using embedded C programming. (b) Analyze the Timer0 in ARM LPC2148 microcontroller to generate signal with 1 ms delay. Consider the input frequency as 1 KHz and clock frequency as 60 MHz. Utilize embedded C programming.	**20**	**CO2**