Question Paper

Exam Date & Time: 01-Dec-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B.TECH. EXAMINATIONS - NOVEMBER / DECEMBER 2023
SUBJECT: ICT 3158- EMBEDDED SYSTEMS

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

1A)	With the help of a neat diagram, explain how a 2 x 2 keyboard can be interfaced to LPC1768. Write an embedded C program to display the column number of the key pressed in a 2 x 4 keyboard on the LEDs connected to P1.1 to P1.0	(5)
1B)	Write an embedded C program to blink the LEDs connected to P0.11 - P0.4. Blink the LEDs connected to even port pins and odd port pins alternatively with necessary delay.	(3)
1C)	Identify and explain the branch instructions used in the operation of signed numbers.	(2)
2A)	Write an embedded C program using an external interrupt to turn ON the LED whenever the switch is pressed. The LED should remain ON as long as the switch is pressed.	(5)
2B)	Write an embedded C program to demonstrate the function of the ADCR (ADC Control Register) in the LPC1768 microcontroller in order to implement the ADC's operation.	(3)
2C)	Discuss the significance of the Current Program Status Register (CPSR) in program execution in the LPC1768.	(2)
3A)	Explain the need of a decoder in interfacing a multiplexed seven segment display to LPC1768. Write an embedded C program to find the largest digit in the long integer value and display the largest digit on a multiplexed seven segment.	(5)
3B)	Write an embedded C program to transfer the message "Make in India" serially on TxD0 (P0.2, function 2), at 9600 baud. Assume 1-start bit, 1- stop bit and 8-bit data (PCLK=3 MHz).	(3)
3C)	Assume R1= -0x9, R0 = 0x8, R2 = -0x3. Write the content of the destination register after the execution of the following error-free code: i) SMULL R1, R2, R0, R2 ii) UMULL R1, R2, R0, R2	(2)
4A)	Discuss the different types of registers used in LPC1768 PWM programming and how are they configured to control the frequency and duty cycle of the PWM signal.	(5)
4B)	Formulate an embedded C program to drive a stepper motor in the anticlockwise direction. Ensure speed variation is also handled in the formulated program.	(3)
4C)	State the contents of the registers R2, R1, and Memory Location 0x20 after the following program. **MOV R2,#0x5** **MOV R1,#0x2** **ADD R2, R1, R2** **ADD R2, R1, R2** **MOV R5,#0x20** **STRB R2,[R5]**	(2)
5A)	Develop an embedded C program to divide the frequency of the square waveform input at P1.18	(5)

(CAP 1.0, function 3) by a factor of 10 on P1.25 while displaying the status of the switch connected to P1.0 on the LED connected to P2.0.

5B) Write an assembly language program to copy a block of 10 words (40 bytes) of memory from source to destination using LDM and STM instructions. The registers R11 and R12 are used for source and destination addresses. (3)

5C) Write one instruction to do the following: (2)
i) To find 2's complement of the content of the register R0
ii) To find the expression A-BC, Where A, B, and C are 32-bit numbers stored in registers R0, R1, and R2, respectively.

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