Question Paper

Exam Date & Time: 02-May-2024 (02:30 PM - 05:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

VI SEM END SEMESTER EXAMINATION MAY 2024

EMBEDDED SYSTEMS DESIGN [ICT 3271]

Marks: 50

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)	A)	Assume that columns of a 4x4 matrix keyboard are connected to P2.10-P2.13 and rows are connected to P1.23-P1.26. Write an embedded C program using GPIO interrupt to display the keycode of the key pressed on LEDs connected to P0.4 to P0.7.	(5)
	B)	Assume a switch is connected to port pin P2.13 (function 1) and eight LEDs on P0.4 to P0.11. Write a program to display the number of times the switch is pressed on LEDs using external interrupts.	(3)
	C)	Write an assembly language program to determine the factorial of a number using recursion.	(2)
2)		Explain the role of double buffering in DAC. Write a program to generate a sine waveform of frequency 1KHz and Peak to peak amplitude of 3 V.	(5)
	A)		
	B)	How do you clear the ADC (Analog to Digital Converter) interrupts. If channel 4 and channel 6 are enabled by ADC interrupts, illustrate how to clear these interrupts using LPC 1768 C statements.	(3)
	C)	With a neat diagram, illustrate different general-purpose registers of ARM processors.	(2)
3)	A)	Assume that the output of a square wave generator (Frequency < 16 Hz) is shorted between P1.18 (CAP1.0, Function-3), and P1.19(CAP1.1-function-3). Write a program to display the frequency of this square waveform in hexadecimal on the seven-segment whose data lines are connected to	(5)
	,	P0.4-P0.11.	
	B)	Briefly explain the purpose of RS232 and MAX232 communication lines used in UART.	(3)
	C)	Write a program to find the sum of natural numbers up to 'N' using MLA instruction.	(2)
4)	A)	Give one example for each, where single edged and double edged PWM can be used. Draw PWM single edged and double-edged output waveforms for the following values of MR registers MR0=150, MR1=22, MR2=45, MR3=78.	(5)
	В)	Illustrate, with a clear diagram, the process of interfacing a stepper motor with an ARM controller. Additionally, write an embedded C program that rotates the stepper motor 270 degrees in the clockwise direction. Assume the step angle is 6 degrees.	(3)
	C)	Write any 4 differences between CISC and RISC controllers.	(2)
5)		Write an embedded C program to divide the frequency of square waveform input at P1.18(CAP1.0 function 3) by a factor of 6 on P1.25 (MAT 1.0 function 3).	(5)
	A)		
	B)	Consider R1= 0x100, with memory map illustration show the position of R1 after the execution of STMDB R1!, {R2, R3}. Additionally, describe the working of descending stack.	(3)
	C)	Illustrate the sensor interfacing with an IoT network, incorporating a clear and organized diagram.	(2)

Duration: 180 mins.

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