Question Paper

Exam Date & Time: 22-Nov-2022 (09:00 AM - 12:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B.TECH(IT) END SEMESTER EXAMINATIONS, NOV 2022

EMBEDDED SYSTEMS [ICT 3158]

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

A

Answer all the questions.

Instructions to Candidates:
Answer ALL questions.
Missing data, if any, may be suitably assumed.

1)		Explain the following instructions with an example for each.	(5)
	A)	i. BPL ii. MLA iii. STM iv. ADDHI v. RRXS	
	B)	Explain how the SOFTWARE mode of ADC can be used to find the difference in analog voltages applied at ADC channel-1 and channel-2.	(3)
	C)	Given PCLK = 6 MHz and TC counts for every 4 PCLK cycles. What is the value to be loaded to MR register to get 1500 ms delay?	(2)
2)		Write an embedded C program to glow an LED connected to P1.23 (PWM1.4, Function-2) with 75% intensity level as long as the switch connected to P0.4 is pressed and 25% intensity level whenever the switch is released.	(5)
	A)		
	B)	Write an assembly language program to find the LCM of two 8-bit binary numbers available in the code memory and store result in the data memory.	(3)
	C)	What is the role of Nested Vectored Interrupt Controller in handling the interrupts?	(2)
3)		Write an embedded C program using timer interrupt to generate a square waveform of frequency 200 kHz with duty cycle 40% on P0.0 using TIMER-1 while simultaneously displaying the status of the switch connected to P0.1 on the LED connected to P0.2. (PCLK = 3 MHz).	(5)
	A)		
	B)	What is "Double Buffering" in DAC? Explain the role of various Special Function Registers in double buffering.	(3)
	C)	Write an embedded C statement to perform each of the following operations: i. Clear the GPIO interrupt generated by P0.4	(2)

ii. To enable GPIO-2 interrupt at NVIC

4) Assume that a switch is connected to P2.12. Write an embedded C program to generate a sinusoidal waveform at A_{OUT} (P0.26, Function-3) with peak to peak amplitude of 1.8 volts and DC value of 1 volt. The frequency of the waveform is controlled by the switch as mentioned in the following table. (5)

A)

Frequency	**Switch status**
4 kHz	ON
8 kHz	OFF

B) Assume that columns of a 2X2 matrix keyboard are connected to P2.12- P2.11 and rows are connected to P0.1-P0.0. Write an embedded C program using external hardware interrupts to display the key code of the key pressed on LEDs connected to P0.3-P0.2. (3)

C) Which is the match register required to toggle MAT0.1 for every 5 clock pulses input at CAP0.0? What is the value to be loaded to this match register to accomplish the task?. (2)

5) What is the role of MAX232 in serial communication? Write an embedded C program using serial interrupt to transfer the message "*Destination Manipal*" serially on TxD0 (P0.2, function 2), at 9600 baud. Assume 1-start bit, 1- stop bit and 8-bit data. (PCLK=3 MHz) . (5)

A)

B) Write an embedded C program to simulate a 4:1 MUX assuming P0.0-P0.3 as MUX inputs and P0.4-P0.5 as selection inputs and P0.6 as output. (3)

C) Calculate the analog input voltage at Channel-4, if the content of ADGDR register of ADC upon successfully converting the Channel-4 data into digital is 0x8000 89F0. (2)

-----End-----