Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

SIXTH SEMESTER B.TECH(CCE) MAKE UP EXAMINATIONS, JUNE-JULY 2023

EMBEDDED SYSTEMS DESIGN [ICT 3271]

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

A

Answer all the questions.

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

1)	A)	Assume that P1.26 (CAP0.0, Function-3) and P1.27 (CAP0.1, Function-3) are shorted externally. Also, assume that the shorted input is connected to a switch. Write an embedded C program to display the duration of this switch pressed on the 7-segment connected to Port-0. Assume the duration to be a positive integer value < 10ms.	(5)
	B)	What is the content of R4 register after the execution of following error free block of code?	(3)

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mov r2, #3

ldr r4, = -5

cmp r2,r4

addlo r2,#2

addhs r4,#5
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	C)	Why does memory mapped I/O technique is more suitable for applications with low memory requirements?	(2)
2)	A)	Identify the type of the following instructions and write the possible addressing modes for source and destination operands. Show the operation performed with suitable examples. i. RSBLT ii. LDM iii. STR iv. PUSH v. ADC	(5)
	B)	Write an embedded C program to simulate a 4-2 encoder assuming P0.0-P0.3 as inputs and P0.6 and P0.7 as outputs.	(3)
	C)	Given PCLK = 6 MHz and PR of Counter-0 is loaded with 5. The counter is configured to count at the positive edges of CAP0.1. What is the content of TC register of Counter-0 at the 32nd positive edge?	(2)
3)	A)	Why do you think that the baud rates of the sender and receiver should be same for serial communication? Write an embedded C program using serial interrupt to transfer the message "Be positive" serially on TxD0 (P0.2, function 1) at 9600 baud. Assume 1-start bit, 1- stop bit and 8-bit data. (PCLK=3 MHz)	(5)
	B)	What are the pros and cons of RISC over CISC?	(3)

C)	For ADC with resolution of 3.3 mV, what is input analog voltage required to produce digital output 0x1BC ?	(2)

4)
A) Compare and contrast single edge and double edge PWM. Develop an application software using single edge PWM to glow a LED connected to P1.24 (PWM1.5, function 2) with 50% intensity. (5)

B) Illustrate the operation of any three ARM assembly language instructions that modify the N and Z flag without the suffix S. (3)

C) Given the contents of registers: R1=0x12345678, R2=0x3578F2EF, R3=0x98765432. What is the content of R6 after the execution of the following block of code? (2)
LDR R13, =0x1000003C
STMDB R13!, {R1, R2, R3}
LDM R13!, {R4, R5, R6}

5)
A) Write an embedded C program for ARM Cortex -M microcontroller-based system to display a 4-bit binary UP/DOWN counter on multiplexed seven segments. The counter should up count if the switch connected to P2.12 is pressed, else counts down. (5)

B) Assume that output of a square wave generator is connected to P1.29(CAP 1.1, Function-3). Write an embedded C program to generate a square waveform on the P1.25 (MAT 1.1, Function-3) whose frequency is one fourth of the frequency of the square wave input at P1.29. (3)

C) Write an assembly language statement for each of the following: (2)

(i) to set the sign flag of ARM microcontroller.

(ii) to find the 2's complement of a 32-bit number available in register R0.

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