Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent institution of MAHE, Manipal)

VII SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV 2019

SUBJECT: MECHATRONICS SYSTEM DESIGN [MTE 4101]

__/__/2019

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Data not provided may be suitably assumed

1A.	Describe the classification of CPU architecture.	**3**	**CO1**
1B.	Enumerate the differences between a microprocessor and a microcontroller.	**2**	**CO1**
1C.	Outline the common characteristics of an embedded system demonstrating a digital camera as an example.	**5**	**CO1**
2A.	Classify the instruction formats in a processor with an example for each.	**5**	**CO1**
2B.	Summarize the CPU power saving strategies used in a micro controller.	**2**	**CO1**
2C.	Discuss the priority of exceptions/interrupts in ARM7TDMI processor.	**3**	**CO2**
3A.	Explain the hazards of 3 stage pipeline in ARM processor.	**3**	**CO2**
3B.	Illustrate at least three multiple load and store instruction in ARM7TDMI with example.	**3**	**CO2**
3C.	Explain the THUMB programmers' model. Enumerate the differences between ARM and THUMB.	**4**	**CO2**
4A.	Develop an ARM assembly language program to count the sum of only even numbers stored in the location 0x20000000 to 0x20000100. Store the result in the memory location 0x20001000.	**4**	**CO2**
4B.	Classify the different types of instruction sets available in coprocessor with an example for each type.	**3**	**CO2**

<table>
<tr><td>4C.</td><td>Write a complete ARM assembly program to perform the following.
a. Load the number in the memory location 0x20000000.
b. Add this number to itself in a loop until an overflow occurs.
c. Store the result in the memory location 0x20001000</td><td>3</td><td>CO2</td></tr>
<tr><td>5A.</td><td>Write an mbed code to sweep the servo in its full range in the clockwise and anticlockwise direction. The servo motor is connected to p21 of an mbed LPC1768.</td><td>3</td><td>CO3</td></tr>
<tr><td>5B.</td><td>Write an embedded C code to implement the object counter for an industry application using LPC1768. Assume that the input key with logic high on pin P1.14 is used to indicate the detection of an object, and A common anode seven segment display is used to display the total count. When the total number of object equals 15, a logic high signal is sent to the output pin P0.25 to pack and counter starts from 0 again.
<table>
<tr><td>LED</td><td>D1</td><td>D2</td><td>D3</td><td>D4</td><td>D5</td><td>D6</td><td>D7</td><td>D8</td></tr>
<tr><td>Seg No.</td><td>g</td><td>f</td><td>a</td><td>b</td><td>h</td><td>c</td><td>e</td><td>d</td></tr>
<tr><td>LPC-1768 Port No</td><td>P2.7</td><td>P2.6</td><td>P2.5</td><td>P2.4</td><td>P2.3</td><td>P2.2</td><td>P2.1</td><td>P2.0</td></tr>
</table></td><td>3</td><td>CO3</td></tr>
<tr><td>5C.</td><td>Write an mbed LPC1768 code to interface 2 mbed devices using UART as follows: Let p9 is used for UART Tx and p10 is used for UART Rx of mbed. Let a push button switch, connected to p20 of mbed 1 is used to increase the intensity of light connected to p21 of mbed 2. A push button connected to p19 of embed 1 is used to decrease the intensity of light of mbed 2.</td><td>4</td><td>CO3</td></tr>
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