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RV COLLEGE OF ENGINEERING®
 (An Autonomous Institution affiliated to VTU)
 V Semester B. E. Fast Track Examinations Oct-2020
Computer Science and Engineering

MICROCONTROLLER AND EMBEDDED SYSTEMS

Time: 03 Hours

Maximum Marks: 100

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

1	1.1	Indicate the values of carry, Auxiliary carry and parity flags after the execution of following instructions? <i>MOV A, # 9CH</i> <i>ADD A, # 64H</i>	01
	1.2	After the execution of <i>MOVC A, @A + PC</i> in the following code, what will be the value in A: <i>ORG 0000H</i> <i>MOV A, #8</i> <i>MOV B, #7</i> <i>MOV R0, #6</i> <i>MOVC A, @A + PC</i> <i>TABLE: DB '0123456789'</i>	01
	1.3	Indicate the total time taken to execute the following 8051 ALP program (include all the instructions for the calculation), given crystal frequency –24 MHz: <i>MOV R1, #3</i> <i>CONT: NOP</i> <i>DJNZ R1, CONT</i>	01
	1.4	Indicate the number of steps required to rotate the 2 phase, 4 winding 200 steps per revolution motor by 216 degree.	01
	1.5	Assume single digit common Anode display is connected to P0, with segment 'a' connected to P0.7 and 'dp' is connected to P0.0. Indicate the hex value to be output to the P0 to get display 'P'?	01
	1.6	Indicate the value to be loaded into the Timer1 register TH1, to get 2400 baudrate at the 8051 serial port, given crystal frequency 11.059 MHz	01
	1.7	Write the value in R0(32 bit number) after the execution of the following ARM instructions: <i>MOV R0, #1</i> <i>MVN R0, R0, LSL #3</i>	02
	1.8	Name the registers of ARM architecture, which are called as LINK Register and stack pointer.	02

1.9	Indicate the value to be loaded into match register <i>MR0</i> , so that timer counter <i>T0TC</i> reaches <i>MR0</i> value after 10 milli seconds. Assume <i>PCLK</i> = 19MHz, <i>CCLK</i> = 40MHz, <i>T0TC</i> = 0	02
1.10	Which port pins are set to 1, after the execution of the following instructions? <i>IO0SET</i> = 1 << 2 1 << 24; <i>IO0CLR</i> = 1 << 24; <i>IO1SET</i> = 1 << 28;	02
1.11	Indicate the analog voltage at the output of the <i>DAC – 08</i> , connected to <i>P0</i> of 8051 after the execution of the following program. Assume <i>DAC – 08</i> is hardware configured to work in the range of 0 – 5 volts. <i>Unsigned int a = 0x140B</i> ; <i>P0 = (Ca >> 8) & 0xFF</i> ;	02
1.12	Indicate the value in the Register <i>A</i> after the execution of the following code: <i>ORG 0000H</i> <i>MOV R0, #5</i> <i>MOV R1, #5</i> <i>MOV A, #00H</i> <i>CONT:</i> <i>PUSH 01</i> <i>DJNZ R1, CONT</i> <i>CONT1:</i> <i>POP 01</i> <i>ADD A, R1</i> <i>DJNZ R0, CONT1</i>	02
1.13	Mention the use of the following signals/pins of 8051: <i>EA</i> and <i>ALE</i>	02

PART-B

2	a	Draw the neat block diagram of 8051 microcontroller and list their specifications.	06
	b	Name the Addressing modes of 8051 microcontroller with example instructions.	06
	c	Describe the meaning of different bits of <i>PSW</i> register of 8051	04
3	a	Define and compare the interrupt driven and polling method of data transfers. Tabulate any four differences.	06
	b	Describe the working of any two conditional and unconditional jump instructions with an example.	06
		OR	
4	a	Write an 8051 <i>ALP</i> to perform the linear searching on 'N' 8 bit numbers and indicate the result and match position.	06
	b	Write an 8051 <i>ALP</i> program to compute sum and average of 'N' 8 bit numbers. Assume numbers and the value of <i>N</i> is stored in code memory. Store the result in data memory.	06

c	<p>Compute the answer after the execution of the following instructions, giving the details of arriving at the result.</p> <pre> MOV A, #99H MOV B, #05H ADD A, #81H DA A ADDC A, #00H DIV AB </pre>	04
5	<p>a Design interfacing circuit and develop application program using embedded C, to interface the stepper motor to 8051 microcontroller and rotate the motor by 180°</p> <p>b Design the interfacing circuit and develop the application program for microcontroller based door locking system. User will feed pre-stored 4 digit key code (say 9875), if the keycode matches door must open. Opening and closing of door is controlled by stepper motor. Draw the complete interfacing circuit and embedded C code to perform the required work. Make suitable assumptions.</p> <p style="text-align: center;">OR</p> <p>6 a Interface 2 × 6 matrix keyboard to 8051 with schematic representation and develop embedded C program to read a key pressed. Send the code pressed to the pc using serial port.</p> <p>b Design the interfacing circuit and develop the application program for microcontroller based function generator (one which generates square and sine waveforms of different frequencies). One toggle key is provided to select the type of the waveform (square / sine). One rotating knob is provided to feed the frequency. Draw the complete interfacing circuit and embedded C code to perform the required work. Make suitable assumptions.</p>	06 10 06 10
7	<p>a Describe with neat diagram, the register organization of ARM7 core. Mention the use of CPSR register.</p> <p>b Compute the output of the following program, indicating the register contents after execution of each instruction.</p> <pre> AREA RESET, CODE ENTRY MOV R0, #01 MVN R0, R0 MOV R1, R0, LSL #31 MOV R2, R0, LSL #2 MOV R3, R2, LSR #2 MOV R4, R2, ASR #1 STOP B STOP END </pre>	10 06
8	<p>a Describe the working and programming of Timer unit of ARM microcontroller LPC2148 with an example program.</p> <p>b Design the interfacing circuit and develop the application program for DC Motor speed control system using ARMLPC2148 microcontroller using PWM block. Draw the schematic diagram and embedded C code to perform the required work. Make suitable assumptions.</p>	06 10

