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RV COLLEGE OF ENGINEERING®
(An Autonomous Institution affiliated to VTU)
V Semester B. E. Fast track Examinations July-2019
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	Write 8051 instructions to select Register Bank 1.	01
	1.2	Indicate the contents of SP and PC after Reset.	01
	1.3	Name the Register of ARM architecture, which is called as Link register.	01
	1.4	How much of flash (ROM) memory and $SRAM$ memory is provided in $89V51RD2$ microcontroller.	01
	1.5	Indicate the number of steps required to rotate the 2-pahse, 4 winding, 200 steps per revolution motor by 216 degree.	01
	1.6	Write the code to configure timer 0 for mode 0 and also as timer, timer 1 for mode 1 and as counter.	01
	1.7	Indicating the values of carry, Auxiliary carry and parity flags after the execution of following 8051 instructions: $MOV\ A, \#\ 9C\ H$ $ADD\ A, \#\ 64\ H$	01
	1.8	Write the values in $R0$ after executing the following ARM instructions: $MOVS\ R0, \#5$ $MOVEQ\ R0, \#10$	01
	1.9	Indicate the total time taken to execute the following 8051 ALP program. Assume crystal frequency as $12MHz$.(Show the calculation) $MOV\ R1, \#3$ $CONT: NOP$ $DJNZ\ R1, CONT$	02
	1.10	Find the contents of Registers $R2, R1$ and $R0$ after the execution of following code: $MOV\ A, \#9CH$ $MOV\ B, \#0AH$ $MOV\ R0, B$ $MOV\ B, \#0AH$ $DIV\ AB$ $MOV\ R1, B$ $MOV\ R2, A$	02

	1.11	Two *LED's* are connected to port bits $P0.0(LED1)$ and $P0.3(LED\ 2)$ of $LPC\ 2148$. Write the code to make the $LED1 - ON$ and $LED2 - OFF$. (Assume *LED* Anode is connected to port pins).	02
	1.12	Compute the values to be loaded into $TH0$ and $TL0$ registers of Timer 0 of 8051, to generate 2 msec delay.(Assume timer 0 is configured for Mode1)	02
	1.13	$LPC\ 2148\ PWM$ unit channel 2 is programmed to generate PWM waveform. Assume $MR0 = 10000, MR2 = 5000$ are loaded, and $PCLK = 15MHz$. Indicate the duty cycle in percentage generated by the PWM unit. (Show the calculations).	02
	1.14	Write the 8051 ALP/Embedded C code snippet to read the data at $P0.1$, if it is '1' output $00H$ else output FFH to $P2$.	02

PART-B

2	a	Draw the neat block diagram of 8051 microcontroller and list their specifications and different addressing modes with examples.	10
	b	Write an 8051 ALP to transfer 10 bytes of data from code memory stored at address $2000h$ to data memory starting at $50h$.	06

3	a	Describe the working of interrupts with reference to the following:
		    i) List all the interrupts and indicate their source, priority and vector address.
		    ii) Function of the special function register *IE*
		    iii) Write an *ISR* program to handle the interrupt generated by the key/switch connected to the 8051 pin $INT0$. ISR program generates a LOW to $HIGH$ pulse on $P0.0$.
			10

	b	Write 8051 ALP program to perform the linear searching on '*N*' 8 bit numbers. Assume the numbers and the result are stored in data memory.	06
		OR	

4	a	Describe the working of Timers with reference to the following.
		    i) Applications of Timers and counters.
		    ii) Working of Timer1 and Mode 2.
		    iii) Write an *ALP* delay program, which generates a delay of 50 milliseconds. Assume crystal frequency of $12MHz$.
			10

	b	Write 8051 ALP program to perform the number conversion from 8bit binary to unpacked BCD and store the answer in data memory.(Ex-FFh gives 02,05,05)	06
5	a	Design 8051 microcontroller based door locking system. User will feed pre-stored 4 digit key code(say 1234), if the key code matches door must open. Opening and closing of door is controlled by actuating a solenoid through one of the port pins. Draw the interfacing circuit and develop embedded C code to perform the required work. (Make suitable assumptions).	10
	b	Explain the use of the following signals/pins of 8051. $*EA, *PSEN, ALE$.	06
		OR	

6	a	Interface/design a 2 digit common Anode seven segment display to 8051. Write an embedded *C* program (using look up table) to implement *BCD* up counter from 00 to 99.	
			10
	b	Write 8051 embedded *C* program to rotate the stepper motor by 120 degree in clockwise direction. Explain the working of the program.	06
7	a	Define an embedded system. Discuss the essential hardware components present in a typical embedded system.	10
	b	Briefly describe the different *ARM* operating modes.	06

8	a	Describe the internal architecture of *LPC*2148 microcontroller with the help of neat diagram with reference to
		    i) Different internal busses.
		    ii) Type of memories and their size.
		    iii) List the different on-board and external buses available to interface other *IC's* and sub systems.
			10

	b	Design smart street light system using *ARM LPC*2148. Interface an *LDR* and *LED* light and write an embedded *C* program to read the light intensity and make the *LED* light glow, when the brightness level exceeds a threshold value.(make suitable assumptions).	06