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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

V Semester B. E. Examinations Nov/Dec-19

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: $MOV\ A,\#F4H$ $ADD\ A,\#A9H$	01
	1.2	On power up, the 8051 uses which RAM locations for registers $R0$-$R7$.	01
	1.3	What is the output of the following code? $ORG\ 0$ $MOV\ R3,\#25$ $CLR\ A$ $MOV\ R2,\#1$ $THERE: ADD\ A,R2$ $INC\ R2$ $DJNZ\ R3,THERE$ $MOV\ 40H,A$ $HERE: SJMP\ HERE$ END	02
	1.4	Find the value of $TMOD$ to operate as timers in the following mode: a) Mode 1 Timer 1 b) Mode 2 Timer0, mode 2 Timer 1	02
	1.5	What is the result stored in bit C after execution of following code? $ORG\ 0000H$ $MOV\ A,\#22H$ $CPL\ A$ $ORL\ A,\#3FH$ $SJMP\ \$$	01
	1.6	Indicate the value in the Register A after the execution of the following code: $MOV\ R0,\#5$ $CONT: MOV\ R1,\#20H$ $MOV\ @R1,\#00H$ $DJNZ\ RO,CONT$ $SETB\ 0$ $SETB\ 7$	02

	1.7	Indicate the number in the $R1$, after the execution of the following code: $MOV\ R1, \#5$ $ANL\ A, \#00H$ $MOV\ R1, A$ $MOV\ R0, \# -128$ $CONT$: $INC\ R1$ $DJNZ\ R0, CONT$	02
	1.8	Indicate the value to be loaded into the timer 1 register $H1$, to get 4800 baud rate at the 8051 serial port, given the crystal frequency $11.059MHz$.	01
	1.9	8 toggle switches are connected to 8051 $P1$(when key is put to ON-port receives logic 1 else it receives logic 0) and 8 $LEDs$ are connected to $P0$ (anodes are connected to port pins, cathodes are shorted to ground through 330 ohm resistors). The keys are set to the following value – (MSB)10101100 (LSB). Indicate the output on $P0$, after the execution of the following embedded C program. Hint : indicate the answer in Hex value in caps without H, example :$A2$ $unsigned\ char\ a;$ $a = (P1 >> 2)\&0x20;$ $P0 = (a\ \&\ 0xff);$	01
	1.10	Calculate the delay value required between the subsequent steps, in milliseconds to run the stepper motor at 20 rpm. Assume 200 steps for revolution and neglect the time for execution of instructions/code. (Example :10)	01
	1.11	Given crystal frequency-$12MHz$, indicate the total time taken by the timer 0 (after timer starts) to set TF flag, after executing the following program: (Hint : indicate the answer in microseconds) $MOV\ TH0, \#0FFH$ $MOV\ TLO, \#0F7H$ $SETB\ TR0$ $CONT$: $JNB\ TF0, CONT$	01
	1.12	Assume single digit common cathode display is connected to $P0$, with segment 'a' connected to $P0.7$ and 'dp' connected to $P0.0$. Indicate the hex value to be output to the PO to get the display 'H'.	01
	1.13	Indicate the size of $SRAM$ (data memory) provided by LPC 2148 microcontroller. Indicate in kilo-bytes,(don't include $USB\ DRAM$ memory)	01
	1.14	Name the register of ARM architecture, which is called as Link register.	01
	1.15	List the ARM microcontroller operating modes.	02

PART-B

2	a	Distinguish between Microprocessors and Microcontrollers.	04
	b	Explain the following instructions with example: i) $DIV\ AB$ ii) DA iii) $DJNZ\ R2, AGAIN$.	06
	c	Draw the block diagram of 8051 microcontroller and discuss its features.	06

3	a	Write an ALP for the following: i) Find the biggest of two numbers ii) 50 bytes are stored from locations $34H$ onwards. Find out how many of these bytes are zero. iii) Write an 8051 ALP program to compute average of n 8-bit numbers.	12
	b	Show the status of CY, AC, P flag and the contents of A after the following instruction execution: i) $MOV\ A, \#0FAH$ $ADD\ A, \#0BH$ ii) $MOV\ A, \#4CH$ $SUBB\ A, \#6EH$	04
		OR	
4	a	With example explain the following instructions: i) XCH ii) CPL iii) $SWAP$ iv) ORL v) $MOVX$.	10
	b	Find the delay generated by timer 0 in the following code, do not include the overhead due to instruction. Frequency is $11.0592Hz$ $CLR\ P2.3$ $MOV\ TMOD, \#01$ $HERE: MOV\ TL0, \#3EH$ $MOV\ TH0, \#0B8H$ $SETB\ P2.3$ $SETB\ TR0$ $AGAIN: JNB\ TF0, AGAIN$ $CLR\ TR0$ $CLR\ TF0$ $CLR\ P2.3$	03
	c	Describe the working of 8051 timers with format of $TMOD$ register.	03
5	a	Briefly explain the following with circuit diagram. i) Relays ii) Opto-isolators iii) Stepper motor iv) H-bridge v) ADC.	06
	b	With the help of LCD interface with 8051 print the message "$RVCE\ CSE$" on LCD display device.	10
		OR	
6	a	Write a C or assembly language program to generate two square waves one with $5KHz$ frequency at pin $P1.3$ and another $25KHz$ frequency at pin $P2.3$. Assume $XTAL = 22MHz$. Initiate the timers using interrupts. Mention the valid ISR for interrupts.	05
	b	Design C or assembly language program in which 10 bytes of data stored in RAM location starting with $45H$ are transferred serially. At the end of data transfer, display the data (i.e .count) on the $P1$. Initiate serial port communication with help of interrupts.	05

	c	Explain the importance of IE register and $SCON$ register in 8051 with format.	06
7	a	In detail explain $ARM\ CPU$ architecture with all its functional units and block diagram.	08
	b	List and explain condition codes of status flags in ARM.	04
	c	With an example explain logical and branch instruction in ARM	04
8	a	Interface a buzzer and generate square wave of frequency $1KHZ$ using timer on $P0.10$ for the ARM controller.	06
	b	i) List any four features of ARM core microcontroller named C 2148.	04
		ii) List and define $GPIO\ PINS$ of $LPC2148$ which are used for connecting interfacing devices such as Ds , switches , $LCDs$, relays.	04
	c	Differentiate between $CPSR$ vs $SPSR$.	02