Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

³⁵ A Constituent Institution of Manipal University

V SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: MICROCONTROLER BASED SYSTEM DESIGN [ELE 3106]

REVISED CREDIT SYSTEM

Tim	ne: 3 Hours Date: 27 NOVEMBE	R 2017	Max. Marks: 50
Instructions to Candidates:			
	 Answer ALL the questions. 		
	 Missing data may be suitably assumed. 		
1A.	Describe in detail the internal RAM organization of 8 register banks of RAM.	051 microcontroller and	l explain the (03)
1B. 1C.	 Explain the following as applicable to 8051 instructions. Direct addressing mode Registe Indirect addressing mode Immedia Use relevant ADD instruction for each of these modes and Show the connection diagram to connect two switches (pp 1.1 and P1.2 of 8051. Connect them in such a way that pin must be low and when switch is closed it should be had following Keep monitoring pins P1.1 and P1.2. 	r addressing Mode ate addressing mode id illustrate with an exam oush button keys) say S1 a t when switch is open, cc igh. Write an 8051 ALP to	ple. (04) and S2 to pins porresponding perform the
	When S1 is closed, set general purpose flWhen S2 is closed, generate a high to low	ag bit 1 of PCON register. v pulse at P 2.3.	(03)
2A.	Write an 8051 ALP to find the maximum score obtained 50marks for a class strength of 40 students. The data starting from 2000H onwards. Display the maximum ma student has scored the same (highest) marks. display th	in a particular course eva i is stored in external RA arks scored at port '0'. If m e count of such students a	luated out of AM locations fore than one at port '1'. (04)
2B.	Write a brief note on parallel I/O ports of 8051 mice functions of all the pins of port 3.	rocontroller & describe t	the alternate (03)
2C.	Calculate the exact time taken for the execution of the 10MHz (ii) XTAL=16MHz. MOV R0, #0EFH	following 8051 program	if (i) XTAL=
	LOOP1:NOP		
	NOP		
	DJNZ R0, LOOP1		
	MOV R1, #00H		
	LOOP3:NOP		
	NOP		
	MOV R2, #0A0H		
	LOOP2:NOP		
	DJNZ R2,LOOP2 DJNZ R1, LOOP3		(03)

- Show the interfacing circuit to interface DAC 0800, an '8' bit DAC to 8051 microcontroller and 3A. write an ALP to display the waveform shown in fig. 03A. Use port '1' of 8051 microcontroller to give the digital input to DAC. Keep doing this continuously and when the Timer '0' interrupts the CPU after 1msec, transfer the current status (output) of the DAC serially at 4800 baud for display. Return back to the main program and continue doing it. Assume XTAL=11.0592MHz.
- 3B. Describe mode 2 operation of 8051 timers in timer mode and compare it with mode 1 i. operation highlighting clearly all the features and differences.
 - ii. Write an 8051 ALP to obtain a 1 KHz, 40% duty cycle waveform on pin P2.1. Use timer '0' in mode 2 to obtain the delay (on and off periods of the wave).
- Describe the functions of all the pins (signals) of a 14 pin, 16 X 2 LCD. Show the interfacing 4A. circuit to interface this LCD to 8051. (03)
- 4B. i. For a 12 bit ADC with V_{REF+} = 3.3 V and V_{REF-} = 0V, determine a) Resolution b) Digital output in binary for an analog input of 2.6V.
 - ii. Show the interfacing circuit to interface ADC 0809 ('8' channel, '8' bit ADC) to 8051 and write an 8051 ALP to convert the analog input applied to channel 3 (IN3) to digital. Display the digital output at port 1. If the analog input is less than 4V, turn on the LED connected to P3.5 pin. Assume $V_{REF+} = 5V$ and $V_{REF-} = 0V$.
- **4C.** Show the interfacing circuit to interface a decimal keyboard (10 keys) in 2 X 5 matrix form to 8051. Assume keys '0' to '4' connected in row 0 and keys '5' to '9' in row 1. Use pins P1.0, P1.1 for rows and pins P2.0, P2.1, P2.2, P2.3 and P2.4 for columns. Write an 8051 ALP to detect the key pressed and display the key code of the key pressed at port 0. Use software de bouncing technique.
- 5A. Highlight the main features of ARM7TDMI processor architecture and list the features i. incorporated and the features not incorporated from Berkley RISC - I processor architecture.
 - ii. Mention the various operating modes of ARM7 processor and list the visible (available) registers in each of these modes.
- 5B. Describe the following ARM7 instruction. Explain all the instruction fields clearly.

SBC {condn} <S> Rd, Rn, operand 2.

Give example instructions for each of the possible case of operand 2. Illustrate anyone with an example.

- 5C. Write ARM7 assembly code to perform the following operation
 - i. Add two 16 bit numbers available in memory locations 0X00009050, 9051 and 0X00009060, 9061. Store the result at 0X00009070 - 9073.
 - Compliment bits D0, D5, D12, D25 and D31 (without affecting other bits) of a 32 bit ii. number available in memory locations 0x0000C020 - C023. Store the result at the same memory locations. Assume little endian format.
 - iii. Multiply a 32 bit number in R0 register by 35 without using any multiplication instruction. (04)



(03)

(06)

(04)

(04)

(03)

(03)