Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV 2019

SUBJECT: MICROCONTROLLER BASED SYSTEM DESIGN [MTE 3103]

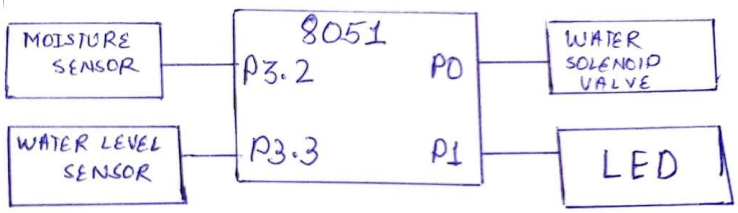
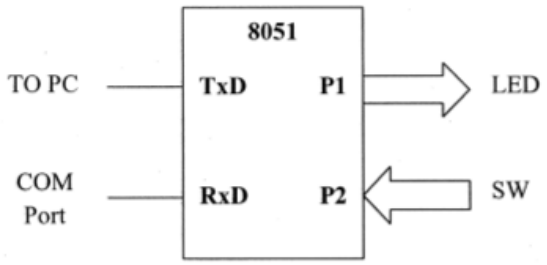
(25/11/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	Classify different ranges of jump and call instructions available in 8051 with suitable design layout.	**03**	**CO1**
1B.	Develop an Embedded C program to compare two eight bit numbers NUM1 and NUM2 and reflect your result as: a) If NUM1<NUM2, SET LSB bit of location 2FH b) If NUM1>NUM2, SET MSB bit of location 2FH c) If NUM1=NUM2, Clear both LSB and MSB of bit addressable memory location 2F.	**03**	**CO5**
1C.	Consider any unsigned number N. Using the formula Y= $\frac{1}{2}\left(x+\frac{N}{x}\right)$, Y can be approximated to the square root of N. Develop an assembly language program to implement the formula Y used to obtain square root of N and store the result in R2.	**04**	**CO2**
2A.	Develop an embedded C program to generate pulse train of 2 second on pin P2.4 using timer1 in mode 1. Consider XTAL=22MHz.	**03**	**CO5**
2B.	Develop an assembly language program for an irrigation system designed using moisture and water-level sensors connected to 8051 microcontroller. The moisture sensor will be used to measure the moisture level of the soil every 10 seconds. When the moisture level falls below 20%, the water solenoid valve will be opened to irrigate the soil. When the moisture level is above 70%, the water solenoid valve will be closed. The water tank will be used as water source in the irrigation system. The water level in this tank will be checked every 50 seconds (using the comparator module) by the water-level sensor. If the water level falls below 20%, it is indicated by displaying it on LED. Pictorial representation of the setup is depicted below.	**07**	**CO4**

			
3A	Construct an embedded C Program to receive 8-bit binary data at P1, through serial communication, convert the received data to ASCII and display it on the LED's connected to P0. Consider baud rate to be 9600.	**04**	**CO5**
3B	The serial port of 8051 microcontroller is connected to the COM port of the desktop PC and on the PC we are using hyper terminal program to send and receive data serially. P1&P2 of the 8051 are connected LEDs and switches, respectively. Write an 8051 assembly language program to (a) send the message " We are ready" to the PC (b) Receive any data sent by the PC and put it to the LEDs connected to P1 and (c) Get data on switch connected to P2 and sent it to the PC serially. The program should perform part (a) once, but part (b) and (c) continuously. Use 4800 baud rate. 	**06**	**CO3**
4A	Summarize the significance of DTE and DCE in data communication and also depict the functionality of DB-9 pin connector.	**03**	**CO1**
4B	Develop an assembly language program to convert 8 bit signed number into 16 bit signed number. Let the 8 bit number be stored in RAM memory location 80H. After conversion store the lower byte of 16 bit number in 80H and upper byte in 81H.	**04**	**CO2**
4C.	Consider the lower three bits of P1 to be connected to three switches. Construct an 8051 assembly language program to send the following ASCII characters to P2 based on the status of the switches as presented in table 4C.	**03**	**CO2**

		SW1	SW2	SW3	ASCII character to be displayed		
		0	0	0	'M'		
		0	0	1	'A'		
		0	1	0	'D'		
		0	1	1	'A'		
		1	0	0	'M'		
		1	0	1	'0'		
		1	1	0	'1'		
		1	1	1	'2'		
	Table 4C						

5A.	Examining the stack, show the contents of the register and SP after execution of the following instructions. All value are in hex.
	
	MOV SP, #5FH
	MOV R2, #25H
	MOV R1, #12H
	MOV R4, #0F3H
	PUSH 2
	PUSH 1
	PUSH 4
	POP 3
	POP 1
						03	**CO1**

5B.	Design an embedded C program a digital clock system where, the hour, minutes and second is displayed in six common cathode 7 segments which are directly interfaced with 8051 microcontroller. The leftmost two digits of the seven-segment display show the hour value followed by two digit minutes value and the rightmost two digits of the seven-segment display show the second's value. The user can set the clock time first by pressing the button S2 connected to pin P3.3.					**07**	**CO5**