Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV 2019

SUBJECT: MICROCONTROLLER BASED SYSTEM DESIGN **[**MTE 2153]
23/11/2018

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A	Summarise the various communication methods used by microcomputers.	**2**	**CO1**
1B	Develop an ARM assembly language program to perform the following operation. Assume fifty 32-bit unsigned numbers are stored in the memory location with the starting address of 0x20000000. Scan the memory location and search the numbers falling in the range 0x00000080 and 0x000000FF. Also, save these numbers in the memory location starting from 0x20001000 onwards.	**6**	**CO2**
1C	Elaborate the working principle of various types of processor organization used in microcomputers.	**2**	**CO1**
2A	Differentiate the following ARM instructions with an example.	**3**	**CO2**
2B	Provide an example to show the importance of following flags in APSR	**2**	**CO2**
2C	Explain the steps required for baud rate generation in UART communication for a) 9600 using 3MHz clock b) 57600 using 12MHz clock.	**5**	**CO3**
3A	Compare maskable and non-maskable interrupts. When more than one maskable interrupt occurs simultaneously, how does the MSP432 controller decide the order in which the controller service the interrupts?	**2**	**CO3**
3B	Write an embedded C code to control the intensity of LED light connected to P2.4 of MSP432 launch pad controlled via keyboard of your computer using UART communication. When the key '+' is pressed, the intensity of the light increases by 10% (however maximum value is limited to 3.3V) and when '-' is pressed, the intensity of light decreases by 10% (minimum value is limited to 0V). Use SMCLK at 12MHz for generating the baud rate of 9600.	**6**	**CO4**
3C	Compare continuous and up-down mode of Timer A module with suitable diagram.	**2**	**CO3**

4A	Write the steps involved to generate the PWM signal in Timer A using UP mode / OUTMOD 7. Mention the duty cycle and period of the PWM signal.	**2**	**CO3**
4B	Develop an embedded C program using MSP432 to compute the rotations per minute (RPM) of a wheel using Timer A edge time mode for the following specifications. A tachometer is used to measure the revolutions per minute of crack's shaft in a car. In a similar kind of prototype system, a transmitter-detector is connected to a wheel that provides high pulse for a short duration of time followed by a low pulse for one complete rotation of the wheel.	**6**	**CO4**
4C	Explain the various buses available in microcomputers.	**2**	**CO1**
5A	List the use of watchdog timer as watchdog timer and interval timer.	**2**	**CO3**
5B	Explain the use of stack in ARM cortex M4 processor with examples.	**4**	**CO2**
5C	Write the major components of microcomputer and explain the importance of clock in reference with each block.	**4**	**CO1**