MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

SEVENTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
NOV 2017
SUBJECT: ADVANCED PROCESSORS AND CONTROLLERS (ECE - 4018)

TIME: 3 HOURS   **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A.   Draw the generic block diagram of an AVR MC. Explain the following:
      (a) AVR data memory
      (b) Stack operation
1B.   What is the role of the following registers in programming IO ports of AVR?
      (a) PORTx,   (b) DDRx   (c) PINx
1C.   List the various resets available in AVR MC.

(5+3+2)

2A.   Assume a switch to be connected to PB.1. The other end of the switch is grounded. Write a single assembly language program to read PORTA when the switch is pressed and check if the received byte is positive or negative.
   (a) If even then display even numbers between 0 to 10 in the seven segment display connected to PORTC.
   (b) If odd then display odd numbers between 0 to 10 in the seven segment display connected to PORTC.
   (c) Assume the LUT having hex codes required for displaying in seven segment display is present in ROM space starting at $100. And common cathode type of seven segment display is used.
   (d) Use suitable assembler directives. Use bit addressable instructions to check the switch status and also to check if the received byte is even or odd in the program.
2B.   Explain .SET assembler directive. Illustrate with an example, how it is different from .EQU directive?
2C.   Identify the addressing modes in each of the following cases.
      (a) IN R15, PINB   (b) ST X+, R20

(5+3+2)

3A.   Write an AVR C program to toggle only PORTB.4 bit continuously every second. Use Timer1, normal mode and 1:256 presaler to create the delay. Assume XTAL=8MHz.
3B.   Write an AVR C program to initialize SPI for slave, mode0, with CLCK frequency = fck/16 and then transmit 'Z' via SPI repeatedly. The received data should be displayed on PORTA.
3C.   Calculate the SCL frequency if the value of TWPS bits in TWSR is 01 and the value of TWBR is 38d. Assume that CPU clock frequency is 8MHz.

(5+3+2)

4A. Write a single assembly language AVR program to perform the following:
- (a) Transmit message "ECE" serially once.
- (b) Read PORTA and transmit the data serially.
- (c) Receive a byte serially and display it on PORTB.

The parts (b) and (c) must be done repeatedly. Assume 9600 baud, no parity and 1 stop bit for serial communication.

4B. Explain the following w.r.to AVR interrupts.
- (a) GIFR   (b)Interrupt priority   (c) Interrupt latency

4C. Depict how a master writes the value 11110000 to a slave with address 1001101 in I2C.

(5+3+2)

5A. Draw the general architecture of a PSoC. Explain the three address space supported by PSoC.

5B. List the analog peripherals supported by a PSoC.

5C. List the drive modes supported by digital IO of PSoC.

(5+3+2)