315338

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1.   **Attempt any <u>FIVE</u> of the following :**   **10**

a) Define an embedded system with an example.

b) List any four features of the Arduino specific AVR microcontroller.

c) List any two applications of ARM microcontrollers.

d) Differentiate between serial and parallel communication. (Any two points)

e) Define real-time operating system (RTOS).

f) Explain the use of pinMode( ) and digitalWrite( ) functions in Arduino.

g) State any four features of Arduino MEGA.

Marks

2. Attempt any <u>THREE</u> of the following :   **12**

    a) Compare PIC, AVR, and ARM microcontrollers. (Any four)

    b) Justify the use of Zigbee and LoWPAN in real-world low-power embedded system applications with suitable examples.

    c) Explain the following features of RTOS

        i)   Scalability

        ii)   Predictability

    d) Explain any four mathematical functions used in Arduino programming.

3. Attempt any <u>THREE</u> of the following :   **12**

    a) Draw and explain the block diagram of a basic embedded system.

    b) Compare ATmega8 and ATmega328 in terms of memory, speed, peripherals and sleep modes.

    c) Compare USB and CAN communication protocols. (Any four points)

    d) Explain how deadlock occurs with suitable example and state strategies to handle it.

4. Attempt any <u>THREE</u> of the following :   **12**

    a) List and explain any four selection criteria for choosing an embedded system.

    b) Explain the IEC 61850 GOOSE protocol and its significance in electric power system applications.

    c) Describe task management in RTOS with inter-task communication.

    d) Explain the role of scheduling algorithms in RTOS.

    e) Write a program to read temperature from LM35 using Arduino.

Marks

5. **Attempt any TWO of the following :** **12**

a) Draw internal architecture of ATmega8 microcontroller. State the purpose of watchdog timer.

b) i) Describe the working of the Serial Peripheral Interface (SPI) protocol with a master-slave configuration.

   ii) Compare SPI with I2C protocol in terms of speed, number of lines, and data transfer.

c) Write a program to interface a relay module with Arduino to control an AC lamp. Explain the hardware connections using interfacing diagram.

6. **Attempt any TWO of the following :** **12**

a) Classify embedded systems with one suitable example. Explain any one in brief.

b) Explain the programming configuration of ATmega8 with respect to I/O ports, counters, and timers.

c) Describe how to interface a stepper motor with Arduino and write a simple program to control it.

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