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03 Hours / 70 Marks Seat No. | | | | | | | | |

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

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

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

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

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

Marks

1. Attempt any FIVE of the following: **10**

a) List any four features of PIC Microcontroller.

b) List any two Logical and any two Relational operators.

c) List the pins used in SPI module of ATmega 32.

d) Write two statement sequence to make lower nibble of PORTA as pullup input and higher nibble of PORTB as output with default output value of logic 0.

e) List any four technical characteristics of Arduino UNO (ATMega 328).

f) State any two analog I/O functions with their syntax and returns.

g) Write the CAN bus data frame format.

Marks

2. Attempt any THREE of the following: **12**

a) Classify an embedded system. State the applications of any two types of an embedded systems (2 applications of each).

b) Explain any two I/O registers associated with each port of ATMega 32.

c) Compare Arduino UNO and Arduino NANO boards based on the following parameters.

i) Analog Input pins

ii) Processor used

iii) USB Connector

iv) Clock frequency.

d) Explain 12C bus protocol with the suitable diagram.

3. Attempt any THREE of the following: **12**

a) Identify the type of an Embedded system used for each of the following applications.

i) Digital Camera

ii) Missile Launching System

iii) Personal Digital Assistants

iv) Weather Monitoring System connected to the internet.

b) List the alternate functions of all PORTB pins of AVR Microcontroller (Atmega 32).

c) Compare Embedded 'C' and Assembly language programming (Any four points).

d) Explain the steps of handshaking to the followed in RS-232 applications with connection diagram of 9-pin RS-232.

4. Attempt any THREE of the following: **12**

a) Compare the features of ATMega 168 and ATMega 328 (Any four points).

b) Explain any four math functions used in Arduino with their syntax and example.

Marks

c) Evaluate the following for AVR C program statements and write the value of the variable after execution.

i) unsigned char t ; t = 0 × 23*2; //t = ?

ii) unsigned int t ; t = 0 × 78 / 34; //t = ?

iii) char d; d = 456; //d = ?

iv) e = 27; e + = 3; //e = ?

d) Draw the format of TIMSK and TIFR register of AVR Timer 0.

e) Explain any four features of USB communication protocol.

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

a) Explain internal memory organization of AVR, ATMega 32 microcontroller with suitable diagram.

b) Write an AVR C program to change brightness of an LED. Use Timer 0 in PWM mode.

c) Draw the connection diagram to interface Ultrasonic sensor with Arduino (UNO) board and write a program to measure the distance of an object and display it on the serial monitor.

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

a) Explain the following characteristics of an embedded system.

i) NRE cost

ii) Processor power

iii) Reliability

iv) Size

v) Time to prototype

vi) Safety.

b) Draw the connection diagram to interface stepper motor with Arduino (UNO) board and write a program to rotate the motor in clockwise direction.

c) Identify the Wireless, Ad-hoc based, short range communication protocol which uses FHSS technique. And write the following for the identified protocol,

i) Any four applications

ii) Features based on frequency range, data rate and range of communication.