

TED (15/19) - 5041  
(REVISION-2015/19)

N23 - 0008290

Reg.No.....  
Signature.....

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER - 2023**

**EMBEDDED SYSTEMS**

(Maximum Marks:100)

(Time: 3 Hours)

**PART - A**  
( Maximum Mark : 10 )

**Marks**

I. Answer **all** the questions in one or two sentences. Each question carries 2 marks.

1. List the features of Atmega32 microcontroller.
2. After executing the following program code, what is the status of carry flag, half carry flag, and zero flag in the status register of Atmega32.

```
LDI R16,0x49
```

```
LDI R17, 0x78
```

```
ADD R16,R17
```

3. Which are the registers associated with an I/O port of AVR?
4. Which are the interrupt sources of AVR?
5. Define the term context switching.

( 5 x 2 = 10 )

**PART - B**  
( Maximum Mark: 30 )

II Answer **any five** questions from the following. Each question carries 6 marks.

1. Draw the block diagram of Atmega32 microcontroller.
2. Which are the data formats in AVR. Give example for each one.
3. Explain Rotate and Shift instructions of Atmega32.
4. List the data types used in AVR C program.
5. Describe SPI used for serial communication.
6. Which are the characteristics of embedded systems.
7. Explain the role of Kernel in Embedded OS.

( 5 x 6 = 30 )

*P.T.O*

**PART – C**

(Maximum Mark: 60)

(Answer *one full* question from each unit. Each full question carries 15 marks.)

**UNIT - I**

- III (a) Describe data memory organization of Atmega32. (8)  
(b) Compare different family members of AVR. (7)

**OR**

- IV (a) Explain the addressing modes of Atmega32 with example. (8)  
(b) Describe the details of Status register of AVR. (7)

**UNIT – II**

- V (a) Write an assembly language AVR program to toggle 8 LEDs continuously which are connected in PORTC. Provide suitable delay between the toggling. (8)  
(b) Which are the conditional branch instructions of Atmega32. (7)

**OR**

- VI (a) Write an assembly language AVR program to multiply two eight bit numbers which are stored in memory locations. Store the lower byte of result in 30H and upper byte in 31H. (8)  
(b) Briefly explain instruction pipeline. (7)

**UNIT – III**

- VII (a) Write C program to convert packed BCD to corresponding ASCII and display on PORTB and PORTC. (8)  
(b) Describe Normal mode operation of Timer0. (7)

**OR**

- VIII (a) Give the steps to program timer interrupt. (8)  
(b) Explain Atmega32 connection to RS232. (7)

**UNIT – IV**

- IX (a) Explain the general architecture of an embedded operating system. (8)  
(b) Describe the terms task scheduling, mutual exclusion and inter task communication. (7)

**OR**

- X (a) Explain the architecture of an embedded system. (8)  
(b) Describe Arduino development board. (7)

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