(c) Explain the function of the following with reference to AVR ADC : (6)

- ADLAR
- ADCH
- ADIF

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5708 **K**

Unique Paper Code : 2512013501

Name of the Paper : Embedded Systems

Name of the Course : **B.Sc. (H) Electronics (Core)**

Semester : V

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **seven** questions in all, out of which you have to attempt any **five** questions.
3. **All** questions carry equal marks.
4. The **first** question is Compulsory. All parts carry equal marks.

1. (a) Differentiate between big endian and little endian convention. (3)

(b) Find the C, Z and H flag bits for the following code (3)

```
LDI R19, 0X82
LDI R22, 0X9F
ADD R19, R22
```

(c) Find the on chip program ROM size in K for the AVR chip with the following address ranges

(i) $0000-$3FFF

(ii) $000000-$1FF (3)

(d) Upon power-on reset of the ATmega32, what memory area is assigned to the interrupt vector table? Can the programmer change the memory space assigned to the table? (3)

(b) With the help of a diagram explain how data is transferred between 2 devices using SPI protocol. (6)

(c) Explain UART communication protocol. Calculate the value of the UBRR register to generate a baud rate of 9600 bps if clock frequency is 8 MHz. (6)

7. (a) Explain the status register in AVR Microcontroller? What is its significance and explain all its bits? (6)

(b) With Fosc = 8 MHz, find the UBRR value needed to have the following baud rates : (6)

(i) 9600

(ii) 1200

(c) What are the various clock sources for ATmega32 microcontroller. Explain. (6)

5. (a) Describe and explain graphically the Normal and CTC modes of the AVR timers. (6)

(b) Write a program to generate a square wave of 125 Hz frequency on pin PC4. Assuming XTAL = 8 MHz, Use Timer 0, Normal mode with prescaler = 256. (6)

(c) Enumerate most widely used sources of interrupts in the AVR. Explain the steps that the microcontroller goes through in executing an interrupt upon activation of an interrupt. (6)

6. (a) Write a program to get data from channel 0 (ADC0) of ADC and continuously display the result on Port B and Port D. (6)

(e) Indicate the rollover value (in Hex and decimal) of the timer for the following case

Timer 0, Normal mode (3)

(f) Find the contents of R20 after the following is executed (3)

```
CLC
LDI R20, 0X4D
SWAP
ROL R20
ASR R20
```

2. (a) What is an Embedded System? What are its essential features? Compare it with a Microprocessor system. (6)

(b) Give at least three differences between RISC and CISC architectures. Also, give an example of each processor. (6)

(c) Briefly explain the function of the following registers :

(i) DDRx

(ii) PINx

where x could represent any of the I/O ports (such as Port B, Port C, Port D). Also explain the purpose of pull-up resistors. (6)

3. (a) Explain the following instructions with the help of an example

(i) ROR R18

(ii) LD R21, X+

(iii) SBI Port B, 3 (6)

(b) Write a program to toggle all the bits of port C with same time delay between ON and OFF states. (6)

(c) Write a program to find the number of 0's in a given byte and send it to Port D. (6)

4. (a) Write a program to : (6)

(i) keep monitoring PB3 bit until it becomes HIGH;

(ii) When PB3 becomes HIGH, write the value $55 to Port C, and send a HIGH-to-LOW pulse to PD4.

(b) What do you understand by pipelining? Differentiate graphically between pipeline and non-pipeline approach.

Also, explain branch penalty. (6)