[This question paper contains 4 printed pages.]

Your Roll No. 25/05/2022

Sr. No. of Question Paper : 1268

A

Unique Paper Code : 32517916

Name of the Paper : Embedded Systems (DSE)

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

Semester : VI

Duration : 3 and 1/2 hours

Maximum Marks : 75

**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, Attempt any **Five** questions.
2. **All** questions carry equal marks.

Q1 (a) Differentiate between general-purpose computing system and embedded system in terms of memory, performance, speed, power consumption, processing power, response time and execution. (6)

(b) What are the different types of embedded systems based on the performance of the microcontroller? Briefly explain each one of them. (5)

(c) It is said that Embedded Systems are Single functioned, Tightly Constrained and Reactive in Real Time.Explain each of these. (4)

Q2 (a) Compare Von Neumann and Harward Architectures. (4)

(b) Draw and explain the Data Memory map (without extended I/O) and Program Memory map of ATmega32 microcontroller. (5)

(c) What are the different reset sources in ATmega32 microcontroller? During Power-Up what are the conditions to be met for the CPU to function properly? Give three ways in which the reset pin can be connected. (6)

P.T.O.

Q3 (a) Which registers are allowed to be used as a pointer for Register Indirect Addressing Mode when accessing RAM? Give their names and show how they can be loaded and used in auto increment and pre-decrement mode. (5)

(b) Differentiate between JMP, RJMP and IJMP instructions. If the current instruction being executed is at ROM location 0x200, How will the program execution change for (6)

(i) JMP 0x12E4
(ii) RJMP 0x2E4
(iii) IJMPZ (Z = 0x12E4)

(c) Explain Program Counter. What is the highest ROM memory location address possible in AVR microcontrollers and why? (4)

Q4 (a) A door sensor is connected to the port B pin 1, and an LED is connected to PORTC pin 7. Write an AVR program to monitor the door sensor and, when it opens, turn on the LED. Draw the circuit diagram. (4)

(b) 8 LEDs are connected to Port B of the controller. Write an assembly language program which toggles all the LEDs after every 20ms. Assume clock frequency = 8 MHz. (5)

(c) Give the details of the sequence of events that take place when an external interrupt is recognized in an AVR microcontroller and corresponding interrupt flag is set. Explain the following interrupt related instructions – SEI, CLI, RETI (6)

Q5 (a) What is PWM? Explain the difference between Fast PWM and Phase-corrected PWM with reference to Timer0. (5)

(b) Why is precsaler used in timers? (5)
If crystal frequency is 6.144 MHz what shall be the Time Period of timer-clock if prescaler of 256 is used.
Also find the overflow time in normal mode for Timer0, Timer 1 and Timer 2 with above prescaler.

(c) Program Timer0 to be an event counter. Use normal mode and display the binary count on PORTC continuously on falling edge. Draw the circuit diagram. (5)

6 (a) What is an Interrupt Service Routine? Is the memory space allocated sufficient for ISR? If no, how and where is ISR written? (5)

What is the priority of INT0, INT1 and INT2 interrupts? Give their vector address and specify the triggering options for INT0 interrupt. (4)

) Assume that INT0 and INT1 are connected to two switches named S1 and S2. Write a program to initialize the interrupt and interrupt service routines (ISR) in which, whenever S1 goes low, the content of PORTC increases by one; and whenever S2 goes low, the content of PORTC decreases by one while at the same time the microcontroller reads the data from PORTA and sends it to PORTB (6)

s) What is ADC? What is the relationship between Step Size and Reference Voltage? (5)
Write a program to initialize ADC to sample Ch2 in Single-ended configuration, Internal 2.56V reference voltage and Right-adjusted result. Assume clock frequency = 4 MHz.

If the system clock is 7.3728 MHz, write a subroutineto initialize USART as per (5) following details –

- Baud Rate - 9600bps
- Data bits - 8
- Parity – Even
- Stop bit - 1

What are the advantages of using serial communication? Explain Simplex, Half (5) Duplex and Full Duplex modes.