**BAHRIA UNIVERSITY, (Karachi Campus)**



*Department of Software Engineering*

**Assignment 3 - Fall 2024**

COURSE TITLE: **EMBEDDED SYSTEM DESIGN** COURSE CODE: **CEN-439**

# Class: BSE - V (C) Shift: Morning

Course Instructor: **ENGR.NOMANAHMED** Time Allowed:  **2 Week**  Submission Date: **13-12-2024** Max. Marks: **5 Marks**

Name: **Bia Fatima** Enrollment: **02-131222-116**

# Question No. 1 [CLO2: 1 Mark]

Construct a code to generate a square wave of 100 Hz frequency pon Pin PORTB.5. Use timer 0, Normal Mode with prescalar = 1024. Assume XTAL = 8MHz.

**Solution:**

#include <avr/io.h>

void main() {

DDRB |= (1 << PORTB5); // Set PORTB5 as output

TCCR0A = 0; // Normal mode

TCCR0B = (1 << CS02) | (1 << CS00); // Prescaler 1024

while (1) {

if (TCNT0 >= 78) { // Compare for 100 Hz

TCNT0 = 0; // Reset timer

PORTB ^= (1 << PORTB5); // Toggle PORTB5

}

}

}

# Question No. 2 [CLO2: 1 Mark]

Construct a code that toggle pin PORTB.3 every 10ms, while at the same time read the switches which is connected from PORTC and send it to LED’s which is connected on PORTD. Assume XTAL = 4MHz.

**Solution:**

#include <avr/io.h>  
#include <util/delay.h>  
void main() {  
 DDRB |= (1 << PORTB3);

DDRC = 0x00;   
 DDRD = 0xFF;   
 while (1) {  
 PORTB ^= (1 << PORTB3);   
 \_delay\_ms(10);   
 PORTD = PINC;   
 }  
}

# Question No. 3 [CLO2: 1 Mark]

A sensor is connected at the entrance of class at T0, construct a code to count using Timer 0 and convert the count into BCD and display in 7 segment connected on PORTD (SEG2 (PD7:PD4) , SEG1(PD3:PD0)).

**Solution:**

#include <avr/io.h>  
void main() {  
 DDRD = 0xFF;   
 TCCR0A = 0;   
 TCCR0B = (1 << CS02) | (1 << CS00);   
 while (1) {  
 uint8\_t count = TCNT0;  
 PORTD = count;   
 }  
}

# Question No. 4 [CLO2: 1 Mark]

Construct a code to send message “Bahria University” to the serial port. Use 8 bits data, 1 stop bit. Assume XTAL = 8 MHz.

**Solution:**

#include <avr/io.h>  
void UART\_Init() {  
 UBRR0L = 51;

UCSR0B = (1 << TXEN0);

UCSR0C = (1 << UCSZ01) | (1 << UCSZ00);   
}  
void UART\_Transmit(char data) {  
 while (!(UCSR0A & (1 << UDRE0)));  
 UDR0 = data;  
}  
void main() {  
 UART\_Init();  
 char message[] = "Bahria University";  
 for (int i = 0; message[i] != '\0'; i++) {  
 UART\_Transmit(message[i]);  
 }  
 while (1);  
}

**Question No. 5 [CLO2: 1 Mark]**

Construct a code that switch is connected in INT0 which is normally high when it goes low it toggle the LED which is connected at PORTC.0. Use external interrupt in falling edge mode

**Solution:**

#include <avr/io.h>  
#include <avr/interrupt.h>  
ISR(INT0\_vect) {  
 PORTC ^= (1 << PORTC0);   
}  
void main() {  
 DDRC |= (1 << PORTC0);   
 EICRA = (1 << ISC01);   
 EIMSK = (1 << INT0);   
 sei();   
 while (1);  
}

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