ASSIGNMENT

T JAYACHANDRAREDDY

AIM: To measure 0 to 100Vdc using microcontroller

Algorithm:

1)Read the voltage from the analog input pin using the ADC.

2)Scale the voltage to the range 0 to 100Vdc using a voltage divider.

3)Convert the scaled voltage to a digital value using the ADC.

4)Display the digital value on an LCD or other display device.

Flowchart:

Start → Read voltage from analog input pin → Scale voltage to 0 to 100Vdc range → Convert scaled voltage to digital value → Display digital value on LCD or other display device →End.

Program:

```
#include <lpc214x.h>

// Function to initialize ADC

void initADC() {

   // Configure P0.23 as AD0.0 input

   PINSEL1 |= (1 << 14);

   PINSEL1 &= ~(1 << 15);

   // Enable AD0.0

   AD0CR = (1 << 0);

   // Set clock rate for ADC (max 4.5MHz)

   AD0CR |= (1 << 8); // CLKDIV = 1

}
```

```
// Function to read ADC value
unsigned int readADC() {
    // Start ADC conversion
    AD0CR |= (1 << 24);
    // Wait for conversion to complete
    while (!(AD0GDR & (1 << 31)));
    // Return ADC value
    return ((AD0GDR >> 6) & 0x3FF);
}
int main() {
    unsigned int adcValue;
    float voltage;
    // Initialize ADC
    initADC();
    while (1) {
        // Read ADC value
        adcValue = readADC();
        // Convert ADC value to voltage (assuming Vref = 3.3V)
        voltage = (adcValue * 3.3) / 1023.0;
        // Now 'voltage' contains the measured voltage
        // Use it as needed (e.g., display, store, etc.)
    }
}
```

Theoretical accuracy:

To calculate the achievable theoretical accuracy, we'll consider the parameters provided:

1. ADC Resolution (N): 10 bits (meaning 1024 possible digital values).

2. Reference Voltage (Vref): 3.3V.

3. Input Voltage Range (Vin): 0 to 100V.

Step 1: Calculate the Step Size (ΔV):

The step size is the smallest voltage difference that the ADC can distinguish. It is determined by the resolution of the ADC and the reference voltage.

$\Delta V = V_{ref/2N} = 3.3V/1024 \approx 0.00322V$

Step 2: Calculate Accuracy in Percent:

Accuracy is defined as the maximum error in the measurement as a percentage of the full-scale input range.

$Accuracy(\%) = (\Delta V\ /Vin_{max)}\ \times 100 = 0.00322V/100V \times 100 \approx 0.00322\%$

The achievable theoretical accuracy for this system is approximately 0.00322%. This means that under ideal conditions, the measurement could have an error of up to 0.00322% of the full-scale input range (0 to 100V).