ABSTRACT

This project presents the development of a Smart Weather and Power Consumption Monitoring System with Real-Time Control using MQTT**,** designed for efficient environmental monitoring and electrical energy management. Utilizing an ESP32-WROOM (38-pin) as the main controller, the system integrates sensors such as the DHT22 for temperature and humidity sensing, and the PZEM-004T for accurate voltage, current, power, and energy readings. Environmental and electrical data are displayed on a 20x4 I2C LCD and transmitted via MQTT to a smartphone-based MQTT Panel application. Real-time control of connected electrical appliances is achieved through a 2-channel relay module, enhancing user interaction and automation capabilities. Power is supplied through a 9V 1A transformer. This system is suitable for smart home applications, providing users with insightful, real-time data and remote-control options for better energy conservation and environmental awareness.

LISTOF CONTENTS

CHAPTER No.	TITLE	PAGE No.
	ABSTRACT	**I**
	LIST OF TABLES	**II**
	LIST OF FIGURES	**IV**
	LIST OF ABBREVIATION	**V**
1	**INTRODUCTION**	**1**
	1.1. Existing System	
	1.2. Proposed System	
	1.3. Overview of the Report	
2	**LITERATURE SURVEY**	**4**
3	**PROJECT OVERVIEW**	**8**
	3.1. Block Diagram	
	3.2. Circuit Diagram	
4	**HARDWARE**	**12**
	4.1 ESP32-WROOM-32 (38-Pin Module)	
	4.2 DHT22 Temperature and Humidity Sensor	
	4.3 PZEM-004T Energy Monitoring Module	
	4.4 LCD 20x4 With I2C	
	4.5 5v Relay Module	

4.6 12 1A Step Down Transformer

4.7 LM2596 Power Supply Module

5	**SOFTWARE**	**51**
	5.1 Arduino IDE	
	5.2 MQTT	
6	**RESULTS AND OUTPUT**	**66**
7	**TESTING AND VALIDATION**	**68**
8	**CONCLUSION AND FUTURE ENHANCEMENT**	**70**
	APPENDIX	**72**
	References	85

LIST OF FIGURES

FIGURE NO.	FIGURE NAME	PAGE No.
3.1.	Block Diagram	9
3.2	Circuit Diagram	11
4.1	ESP 32	13
4.2	ESP 32 Pin Out	16
4.3	WROOM-32 Block Diagram	24
4.4	DHT-22 Temperature and Humidity Sensor	25
4.5	DHT-22 Pin Out	27
4.6	PZEM-004T Sensor	29
4.7	PZEM-004T Pin Out	31
4.8	20x4 LCD Display	34
4.9	I^2C Module	35
4.10	I^2C Pin Out	36
4.11	Block Diagram of LCD Display	37
4.12	Picture Of Relay	39
4.13	Pin Diagram Of 5V Relay	40
4.14	Transformer	45
4.15	Pin Diagram of LM2596 Module	48
4.16	Picture of LM2596 Module	50
5.1	Arduino IDE	57
5.2	MQTT Publish/Subscribe Model	61
6.1	Layout	65
6.2	MQTT Pannel	66

LIST OF TABLES

TABLE No.	TABLE NAME	PAGE No.
4.1	Board Specifications	13
4.2	Functions And Notes	16
4.3	VSPI Pins	18
4.4	HSPI Pins	19
4.5	UART Pins	20
4.6	ESP32 GPIO	23
4.7	Technical Specifications-DHT22	26
4.8	Technical Specifications-PZME-004T	30

LIST OF ABBRIVATION

ABBREVATION	DESCRIPTION
LCD	Liquid Crystal Display
IDE	Integrated Development Environment
MQTT	Message Queue Telemetry Transport
DHT	Digital Humidity and Temperature
UART	Universal Asynchronous Receiver Transmitter
I2C	Inter-Integrated Circuit