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TITLE: HOMESTAY POWER SWITCHING CARD SYSTEM (HOPs-C)

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SUPERVISOR'S ENDORSEMENT

" I hereby declare that I have read through this report entitle "Homestay Power Switching Card System (HOPs-C)" and found that it has comply the partial fulfilment for awarding the degree of Bachelor of Electrical Engineering (Control, Instrument and Automation)"

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Date : 28 MAY 2014

HOMESTAY POWER SWITCHING CARD SYSTEM (HOPS-C)

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A report submitted in partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering (Control, Instrumentation and Automation)

Faculty of Electrical Engineering
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2014

STUDENT DECLARATION

I declare that this report entitle "Homestay Power Switching Card System (HOPs-C)" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : MUHAMAD HAFIDZI BIN ISMAIL

Date : 28 MAY 2014

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ABSTRACT

Nowadays, there are many homestays built in Malaysia especially in tourist attraction areas. However, some of homestay owners had to pay a relatively high electricity bill especially during school holidays. The main purpose of this project is to design homestay power switching card system which can reduce the waste of electricity and also to analyze the pattern of power consumption between private home and homestay. Most homestay in Malaysia do not use any tools to control their use of electricity and reduce wastage of electricity. One of the electric saver that sell in the market is capacitor bank and there has another technique to cut OFF the electricity power supply which is Automation of Residential Electricity Cut OFF Using Network Based Embedded Controller. This project come out with the product named "Homestay Power Switching Card System (HOPs-C)". This project implements Radio Frequency Identification (RFID) as a tool to control the switching system using RFID card and reader. The product also easy and simple operation of power cut OFF system. The power supply will cut OFF when the RFID card is removed from the card holder. When the RFID card is inserted in the card holder and the reader reads the exact number of RFID card, the system will turn on the power supply. This system also will display the amount of power consumption that used in the homestay on the Liquid Crystal Display (LCD). The survey also conducted in order to complete the project. The majority of homestay owners agrees with the project objective.

ABSTRAK

Pada masa kini , terdapat banyak inap desa dibina di Malaysia terutamanya di kawasan tarikan pelancong . Walau bagaimanapun, sesetengah pemilik homestay terpaksa membayar bil elektrik yang agak tinggi terutama semasa cuti sekolah. Tujuan utama projek ini adalah untuk mereka bentuk sistem kad pensuisan kuasa di inap desa yang boleh mengurangkan pembaziran tenaga elektrik dan juga untuk menganalisis corak penggunaan kuasa antara rumah peribadi dan inap desa. Kebanyakan inap desa di Malaysia tidak menggunakan sebarang alat untuk mengawal penggunaan elektrik dan mengurangkan pembaziran elektrik. Salah satu penjimat elektrik yang menjual di pasaran adalah bank kapasitor dan satu lagi teknik untuk memotong bekalan kuasa elektrik adalah *Automation of Residential Electricity Cut OFF Using Network Based Embedded Controller*. Projek ini adalah untuk mencipta produk yang dinamakan *"Homestay Power Switching Card System (HOPs-C)"*. Projek ini melaksanakan *Radio Frequency Identification (RFID)* sebagai alat untuk mengawal sistem pensuisan yang menggunakan kad RFID dan pembaca kad . Produk ini juga operasi yang mudah untuk memotong sistem bekalan kuasa. Bekalan kuasa akan terputus apabila kad RFID dikeluarkan dari pemegang kad. Apabila kad RFID dimasukkan dalam pemegang kad dan pembaca yang membaca jumlah sebenar nilai kad RFID , sistem akan menghidupkan bekalan kuasa. Sistem ini juga akan memaparkan jumlah penggunaan kuasa yang digunakan dalam inap desa tersebut pada Paparan Kristal Cecair (LCD). Kaji selidik juga dijalankan untuk menyiapkan projek itu. Majoriti pemilik inap desa bersetuju dengan objektif projek ini.

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RFID	-	Radio Frequency Identification
LCD	-	Liquid Crystal Display
IEEE	-	Institute of Electrical and Electronics Engineers
KWh	-	Kilowatt hour
PIC	-	Peripheral Interface Controller
RM	-	Ringgit Malaysia

CHAPTER 1

INTRODUCTION

1.1 Project Background

This project is about to design a system that can cut OFF the flow of electricity automatically in homestay when there are no people in the house. This system is named as Homestay Power Switching Card System (HOPs-C). Homestay is a house providing a space or room for tourist to rent a place to stay. In Malaysia, there are many homestays built especially in tourist areas [1]. According to the survey, some homestay owners had to pay a relatively high electricity bill especially during the school holidays. This is because most of homestay provides complete facilities such as refrigerators, cooking appliances, televisions, air conditioners and other electrical appliances. The electricity consumption will also increase especially with the use of air conditioning for long periods. Other than that, tourists who stay at homestay do not switch OFF the power supply of electrical appliances especially air conditioner when they are not in the homestay because they want environment in homestay is always cold. Air conditioners which operate every hour without stop will make the electricity bill increases. Furthermore, majority of homestay do not ave a system that can cut OFF the power supply automatically when the tourists come out. So, this power switching card system is an idea to overcome the problem that faced by the homestay owners. This project uses

Radio Frequency Identification (RFID) as tools to cut OFF the electricity flow. RFID system consists of two parts which is card and card reader. When the card is removed by the tourist, the system immediately will cut OFF supply electric into the homestay. Energy consumption will display on the Liquid Crystal Display (LCD) and this make homestay owners easier to see the energy usage of their homestay. The Figure 1.1 and 1.2 show the simple structure of the system and instrumentation part of energy reading, respectively.

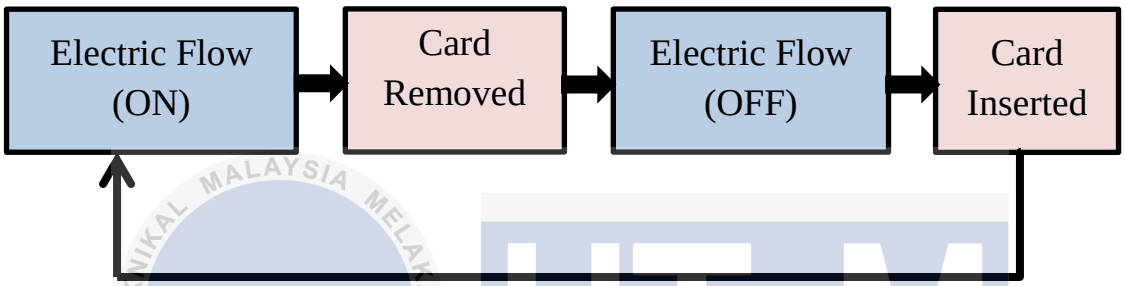

Figure 1.1: Simple Structure of the System

Refer Figure 1.1, when the card is inserted in the card holder, the RFID reader will read the number of the RFID card. If the number that reader read is same to the number that stored in the system, the system will energize the contactor and turn ON the power supply to flow the electricity. The electricity will continue flow if the card still in the card holder. If the card is removed from its holder, the system will automatically cut OFF the power supply and the flow of electricity will stop. This process is repeated as key as the card is inserted or removed.

The process of reading the energy consumption in the homestay is shown in Figure 1.2. In this system, an energy meter used to capture the usage of power (watt) in homestay. The energy meter will display in the LCD dispaly power consumption that tourists used within they stayed at the homestay.

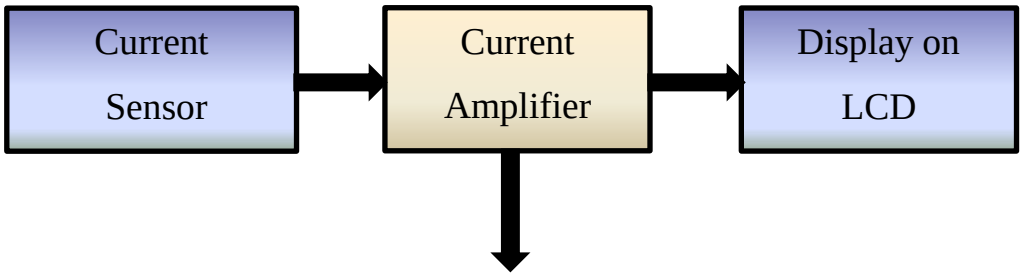

Figure 1.2: Instrumentation Part (Energy Reading)

1.2 Problems Statement

In homestay industry, a higher electricity bill in the homestay industry was the main issue why this project has to develop. Electricity bills will increase especially when school holidays as more tourists will come to the homestay. From the survey, homestay owners need to pay higher for the electricity bill on school holidays compared to the other months. Besides, the behavior of tourists when they stay at homestay also becomes the problem to homestay owners. They leave the homestay without switch OFF the electrical appliance especially air conditioner. Most of them do not concerned and less responsibility for the equipment they used.

In addition, the emphasis on safety precaution at the homestay is also vitally important to avoid unexpected incidents. Long term usage of electrical appliance without switch OFF will cause the faulty equipment and maintenance costs will increase and also power control for the unused electrical appliances. The homestay owner will be informed about the concept of the project and about the convenient solution to reduce the massive amount of unused energy consumption in homestay accommodation.

1.3 Project Motivations

The first motivation to develop this project is to create products with reasonable price for homestay owners. This project will help homestay owners in order to reduce their monthly electricity bill. In addition, homestay owners also can promote energy saving awareness to the people who stay at their homestay. Due to lower rental of homestay, then every expenses must be well managed, especially electricity bill management [3].

Furthermore, this system will implement RFID because RFID system still not widely apply at homestay accommodation. From the respondent feedback, almost of homestay does not use any electric saver or the system that able to cut OFF the flow of the overall electricity. There is various electricity saving products on the market [4]. Thus, the creation of this project is expected to diversify products' energy saving devices in the local market especially the device which can control electricity consumption and also give more options to users to choose the best product. Lastly, the selection to use RFID system is because this RFID easier to find in the market and the cost of this system also cheaper than other system like barcode system [14]. Other than that, this system also has its own benefit like the number of the RFID card cannot to duplicate and each of the cards have their own unique characteristic number. So, the tourist cannot use another card to turn ON the power supply.

1.4 Objectives of Project

The objectives of this project are:

i. To conduct a survey to at least 20 of homestay owners to find out the electricity consumption in homestay.
ii. To design homestay power switching card system which can reduce the waste of electrical.
iii. To analyze the pattern of power consumption between private home and homestay.

1.5 Scopes of Project

The scope of the work for this project includes survey among the homestay owner around Kedah, Kuala Lumpur and Melaka. This project also has simulation part. The simulation of this project will be tested before it copy to the prototype module. This project used PIC Microcontroller, Proteus and the prototype will use the concept of single phase domestic wiring. The analysis is performed based on the experimental and survey. Besides, the energy consumption and electricity usage will be capture by using energy meter.

In this project, the system design process can be divided into four main parts. Firstly, design of energy meter to display the energy consumption. Second, design of system to key in the new RFID card number when touch at reader. The third, design display system part using Liquid Crystal Display (LCD) and the last is to design a system that will cut OFF the electricity flow when the card is removed.

1.6 Report Outlines

This report consists of five chapters. First chapter discusses about the project background, problem statement, objective and scope of this project. Then, Chapter 2 will discuss more on project background and literature reviews that related to this project. It will discuss about Radio Frequency Identification, electricity consumption and other method to save the electricity energy consumption. In Chapter 3, it will discuss on the methodology, hardware and software implementation of the project. While Chapter 4 will be presenting the result and discussion of this project. The last chapter will discusses the conclusion of this project and recommendation in the future works for project improvement.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, it is basically based on understanding the literature review that related to this project. Study in this chapter is focused more on radio frequency identification, electricity consumption and energy saver. Other than that, this chapter also discusses about other electricity cut OFF techniques.

2.1.1 Radio Frequency Identification (RFID)

Radio frequency identification (RFID) is a system that sends the characteristics in the form of a unique number of an object using radio waves. The main components in RFID system are RFID tag and RFID reader. When RFID tag is tagged to the reader, it will read the tag information data before it will send the data to the RFID user interface.

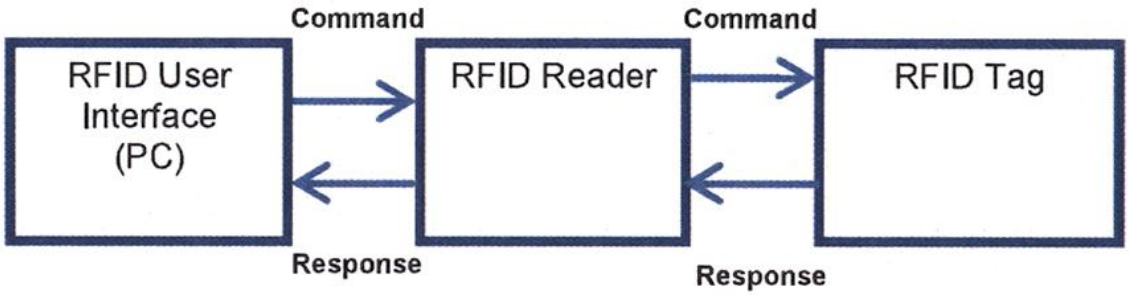

Figure 2.1: The Block Diagram of RFID System

Figure 2.1 shows the block diagram of the RFID system. The RFID system has become more popular, with various strengths and advantages such as recognition speed and non-touch method [5-6]. The capability of the RFID system is considered and tested because it is important to achieve a target. Nowadays, radio frequency identification is a kind of electronic identification technology that is becoming widely deployed and it was the factor RFID was chosen as a main function in this project. Many of companies over the world have been used RFID systems to improve efficiency in their business process and security issues [7].

RFID is a technology system that enables the electronic labeling verification and wireless identification of an object using digital communication transition [5]. Other than that, the price of the RFID device also lower compares to bar code device and easily found in the market. RFID tags can hold up to 32 Mega Bytes of information data and making the data more difficult to be duplicating than barcodes [6]. These benefits were considered as major advantage over barcodes along with the large capacity of storing information data that the RFID tags offer in comparison to the barcode tags. Information is exchanged to radio frequency where no contact or no line of sight is needed for the identification process. This makes RFID more secured since a reader was designed to locate tags in a distance of several meters [7]. An RFID tag can have a much longer read range than other identification techniques [7]. By using this system, tourist cannot use another card because each of cards has their own unique number. There are some

advantages of using RFID in this project. Figure 2.2 shows the advantages by using this system.

RFID was chosen to implement in this project because it not widely used for electricity cut OFF system. Furthermore, this RFID also not widely used in homestay industry to compare hotel industry. Although the hotel industry used this RFID system but they only used this system for door security, not to cut OFF the electricity in hotel room [13-14]. Other that, the price of the RFID was also the factors RFID is chosen. RFID equipment is cheaper than others scanning method like a bar code. RFID also has multiple choices of the length of frequency and more reliable than other products [5-7].

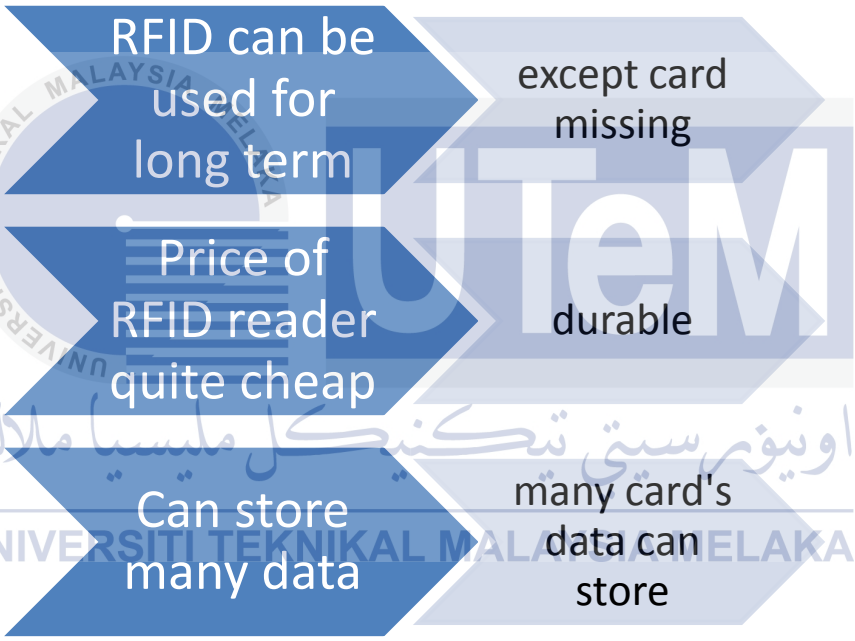

Figure 2.2: Advantages of RFID System

2.1.2 Electricity Consumption and Energy Efficiency

Good management of our household energy consumption can lower our annual electricity costs without making our home become less comfortable, but will make our home more valuable. The entire electrical appliance consumptions in a real home have to analyze especially heavy electrical appliance to get results in more energy-efficient and consequently lowered the electricity bill [8]. The target is to make it clear that almost of homes have the potential to become more energy efficient and ending in the savings on the electricity bills. In addition, using electricity more efficiently and more reliable electricity system, it will help to protect the environment. It is common thing for electricity to compare with another energy source; it is the cleanest and the most comfortable kind of energy to be used.

By saving electricity does not just save money, but it helps keep the air clean, reducing air pollution and the water as well. The air conditioner is a one of the main drivers to increases in electricity consumption and more toward to electricity peak. The building size or type does not make a great difference but the quantity and quality of the electric appliances give more effect to the electricity consumption. Procedures to improve energy efficiency at home by taking a whole-house energy efficiency to find out which parts of the house use the most energy. It is worthwhile starting at the place where there are the greatest energy losses. Buying a high-efficiency electrical appliance needs a bigger initial investment, but when added with a long period of lower energy consumption it may be a better choice. Besides that, by choosing a high efficiency appliance will contribute to a better environment, reducing emissions of carbon dioxide over the next few years [8-10]. This project is created mainly for reducing electricity consumption in homestay accommodation. Most of homestay accommodations have higher electricity bills. There are several factors that influenced higher paid of electricity bills.

Figure 2.3 shows the factors that influenced higher electricity bill in homestay. The figure above mention the main factors that homestay owners had to face. So, all of these problems have to resolve as best as possible.

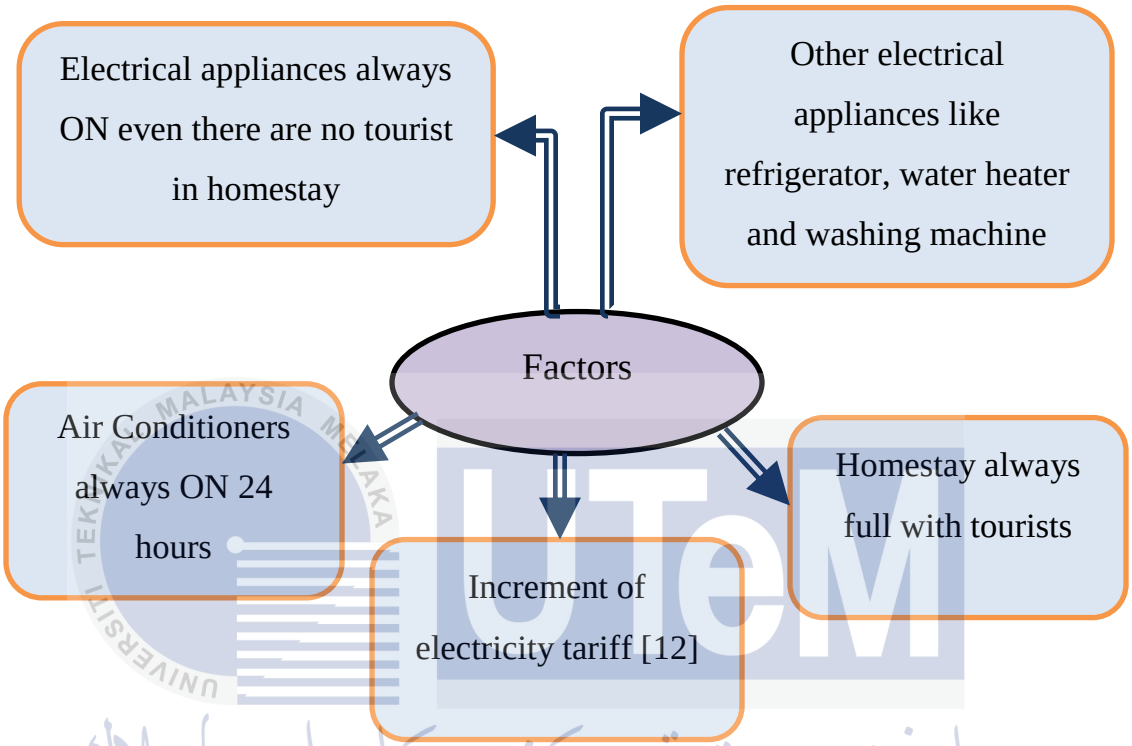

Figure 2.3: Factors Influenced Higher Electricity Bill

2.1.3 Energy Saver

Electricity consumption can be saved in various ways, but in this technological era, everything must be done easily, quickly and efficiently. Therefore, the designers took the initiative to design a tool that can easily save electrical energy consumption. The approach used for electric energy saving is active power factor correction. Active power factor correction circuit works for power factor pre-regulator with power factor correction up to 0.98 on any line voltage between 80 Vrms and 260 Vrms [4]. According to B.M. Weedy, there are three main characteristics that influence the generation and transmission of electrical energy, such as electrical energy itself cannot be stored for a long time and it must be controlled in order to make sure energy production from generators is equal to the energy received by the load, amount of energy generated must be increased in order to fulfill user requirements and the problem of station position and energy delivery distance must be considered from economic sides.

Lately, there are many different types of energy saving products. These products usually advertised in internet and newspapers. However, the effectiveness of the products cannot be ascertained yet. Features as well as information about how the product works also do not mention by manufacturers. In addition, users also doubted about their safety if they used the products constantly [4]. So, many companies created a product that can improve the low power factor. Low power factor gives poor electrical efficiency. The lower the power factor can cause the higher the apparent power drawn from the distribution network. From Dr. S. A. Qureshi andKh. Nadeem Aslam, it state that the disadvantages of low power factor are the current will increase then in term causes increase in copper losses and the efficiency of both apparatus and the supply system will decrease, the voltage regulation of generators transformers and transmission line increases[11]. Then, transformers, transmission lines, generators and switches become overloaded and also cause the cost of generation, transmission and distribution increase. So, author of the journal suggests using power factor improvement as a method of conservation of electrical power. This technique provides economical as well as system advantages because it will save electricity bill by reducing kilowatt per hour

(KWH), voltage improvement due to reduction in voltage drop and energy losses reduced.

Figure 2.4: Example of Small Capacitor Bank

The best solution for power factor improvement of the distribution system is connected capacitor with each inductive load, whether in domestic or industrial used. This because power factor improvement which used capacitor bank capable to achieve power factor as close as unity, compact along efficient and protected against over voltage, over-current over temperature and drastic switching[11]. By using capacitors, power utility of the load can be known and also reduced reactive power. Reactive energy has been supplied by capacitors. Installation of power capacitors on the electrical distribution system is used to supply the reactive power required by inductive electrical equipment. The savings the utility needs in reduced generation, transmission, and distribution costs and also effect to the customer in the form of lower electric bills. This project is not about to make any improvement or adjustment of the electrical system but this project about to cut OFF electricity when it no longer needed. That means, the electricity will be cut if there has no tourist in homestay.

2.2 Other Technique to Cut Off Electricity

Based on the previous work from the internet finding, there is one technique to cut OFF the electricity power supply which is Automation of Residential Electricity Cut OFF Using Network Based Embedded Controller [15]. In this technique, it was the collaboration between Tenaga Nasional Berhad (TNB) and the domestic users. Through this system, the system will alert or mention user if and only if the user reach the limit of the electricity usage. The system automatically cuts OFF the power supply when the users exceed the electricity usage limit. Once the user exceeds the limit of electricity usage with the unpaid bills, the admin has the authority to cut OFF the electricity supply. The system is expected to help the Malaysian users with their electricity by managing their daily electrical power consumption. The system used ZigBee module that attached to the meter by using an interface board and the data collector is connected to the central computer by using GSM. The system is suitable with Malaysian condition which already implemented GSM-based AMR in LPC. The system is proposed to improve TNB services efficiency by implementing the automatic cut OFF system once the customer's power consumption reach to the limit. The system consists of networked embedded devices which are integrated with the main management system in the data center. Besides, the system also used MBED NXP LPC1768 and it is designed for prototyping all sorts of devices, especially those including Ethernet, USB, and the flexibility of lots of peripheral interfaces and FLASH memory.

This system does not cut OFF the electricity immediately without the warning, but it will inform the users before they reach 100 percent of usage. The first and second warning will send to the customer when the consumption reached 80 and 90 percent of usage. When the consumption of electricity reached 100 percent usage, the system will automatically cut OFF the supply. When the customer pays the bill, the system then automatically reconnects the supply as usual. The researchers used MBED, an embedded microcontroller, for automatic meter reading and control main switch of power meter that connects to the main power supply.

2.3 Summary of Review

From the literature review, most of journals [2, 4, 10, 11] discussed more to the household energy consumption, energy efficiency and method to reduce electricity consumption. Electricity bills increase mostly depend on the electrical appliances [8-10]. Some of the journals also highlighted about the environment and pollution. There have several methods to control the electricity consumption, but the most popular method is power factor improvement. Power factor improvement which used capacitor bank needs some maintenance. The benefits by using this power factor improvement are voltage level of the electrical installation systems become more stable, improved voltage regulation due to reduced line voltage drop, efficiency of electrical appliances in the premises increased, no more problems of losses energy and period of electrical appliances will last longer. In this project, RFID will be used as a main tool because due to its advantages like it become more popular lately, widely used in many industries, more secure and sold cheaply on the market. Furthermore, it is better compared to barcode scanner because it can track objects from a long distance, can store more information data and the price is lower. This project will design a product which efficient as well as less maintenance and easy to use. At the end, this project will become one of the methods that can reduce energy consumption and make energy more efficient.

CHAPTER 3

DESIGN METHODOLOGY

3.1 Project Methodology

This chapter will explain the project's methodology and approach to complete this project. The methods that have be taken to accomplished this project include an survey, simulation designing, hardware setup and product testing. For clearer view of the flow and the methods have been used, the block diagram is added in this chapter. There are flows of the project in result to achieve each objectives. Various method have been used in this chapter in order to achieve the objective which stated in the chapter 1.

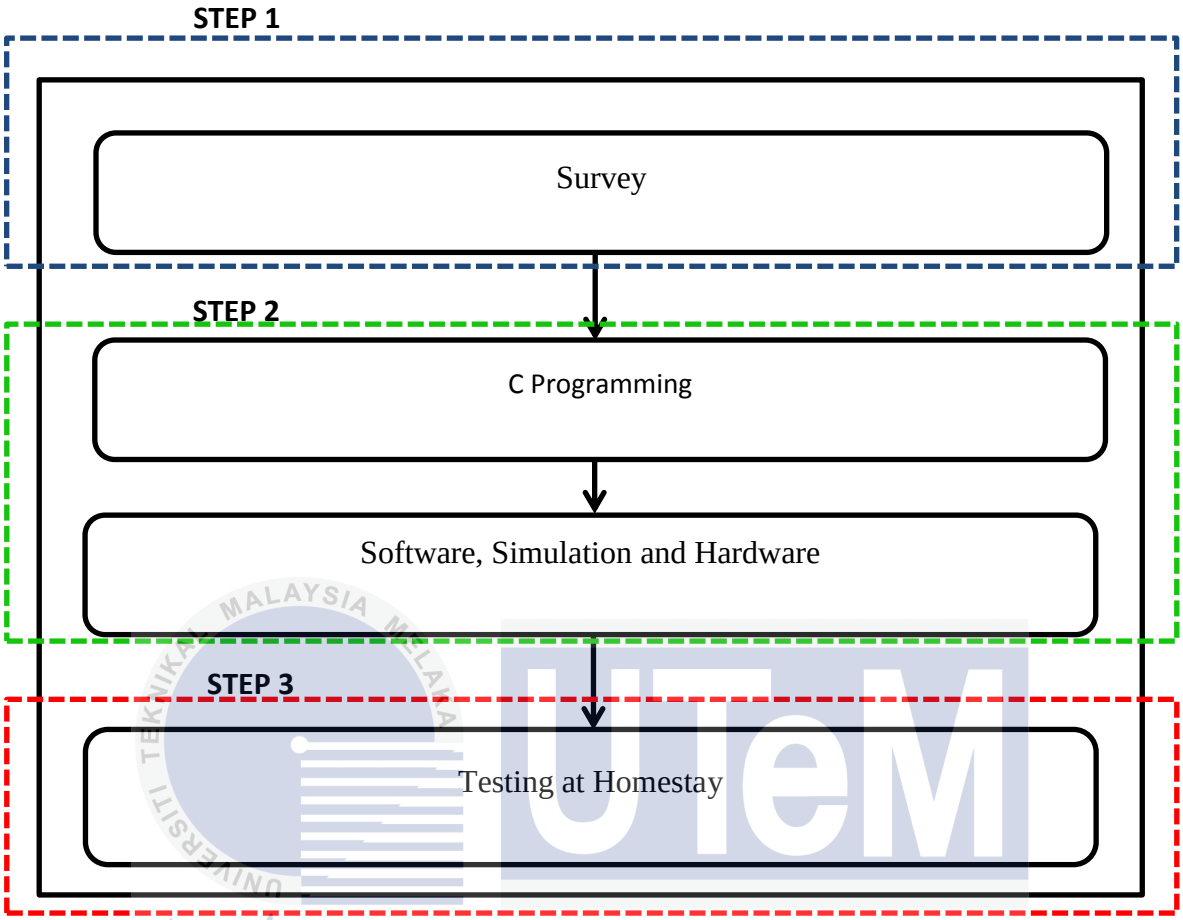

Figure 3.1: Flow to Complete the Project

There are guidelines to be follow in order to complete the project. Figure 3.1 shows the flow that has to follow in order to complete the project. The first step is conducting the survey. This step is about collecting some data to be analyzed and will be reference for this project. The next step is about designing which include the programming, simulation and hardware development. This step must be complete before proceed to the last step which is testing the project. This testing step will do at one homestay. Step 1 represent to achieve first objective, step 2 for second objective and the last step will be conducted to achieve third objective.

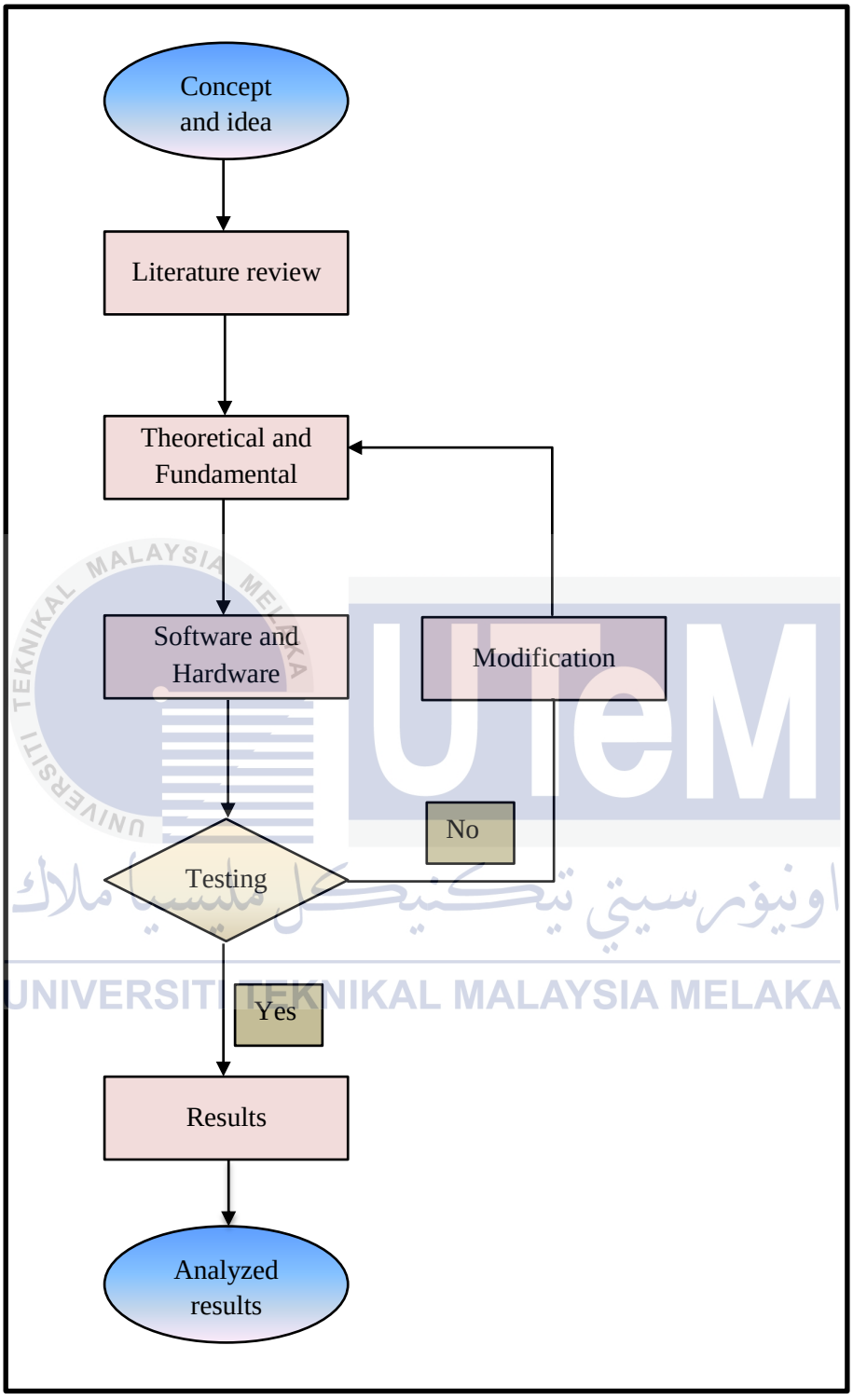

Figure 3.2: Flow Chart for Overall Project

Figure 3.2 shows the flow chart for overall steps in this project. The start point for this project is come out with the concept and idea. The idea is about to design an innovative product that can be a switch system for the homestay. The switch means it can cut OFF overall electricity flow in homestay and save electricity consumption. After the concept and idea, the next stage is literature review. Literature review is a method to find more information, additional idea about the project and compare related existing works that have been done by the researcher. Theoretical and fundamental part has to be done to gain more information about software and hardware that will be used in this project. Besides, this part also to learn the details about the apparatus and equipment used to complete the project. After finished the software and hardware stage, testing part will carry out. If hardware does not work properly, the structure of hardware and simulation will be modified. The modification stage is quite important for project to get as best product. After finished modification, the product will go for testing again. If there have no problem to the product, it will be test in homestay and the results that obtain from the project will be analyzed.

3.2 Methodology to Achieve First Objective

(Conduct a survey to at least 20 of homestay owners to find out electricity consumption in homestay)

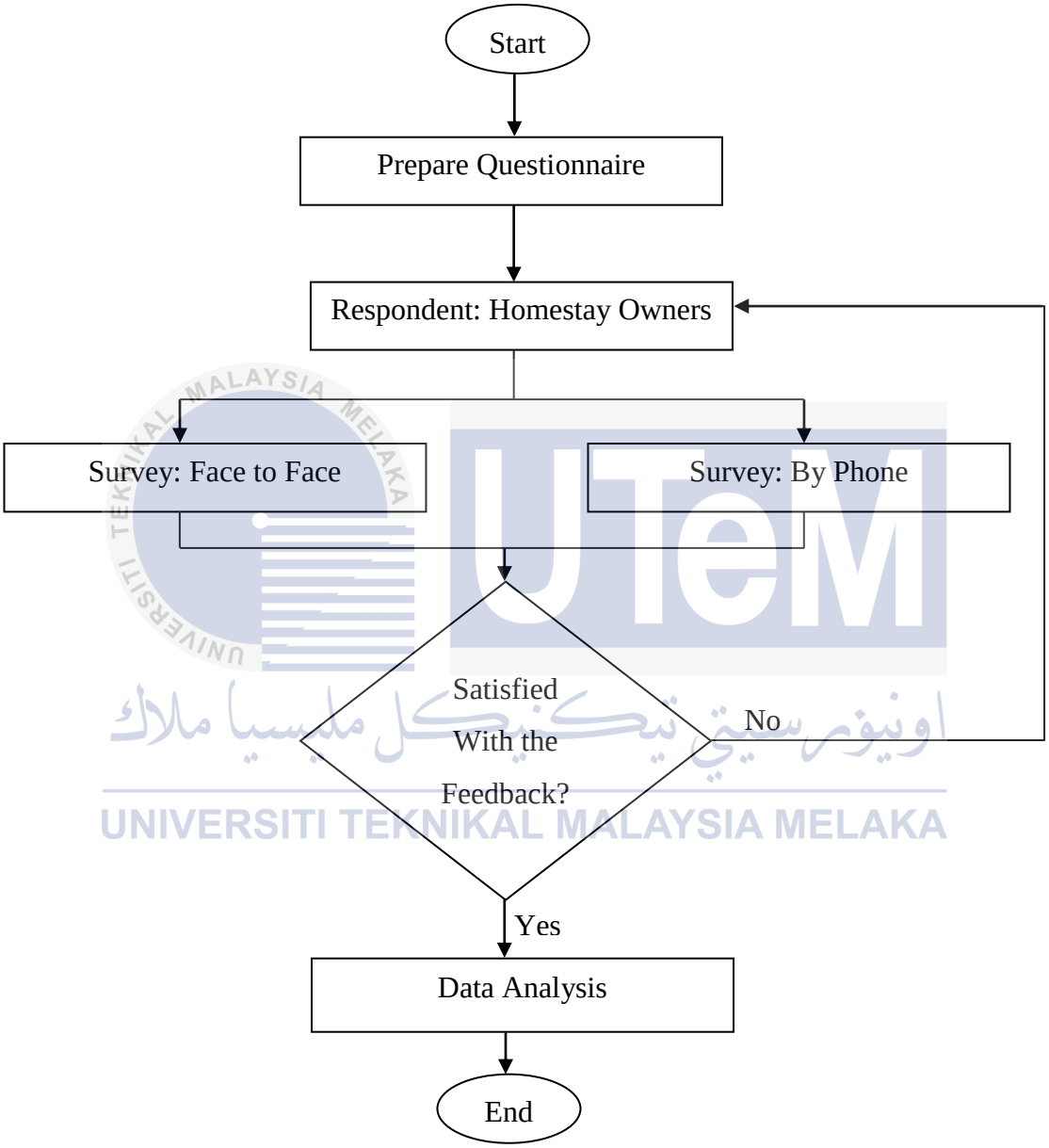

Figure 3.3: Methodology of First Objective

The first objective of this project is to conduct a survey at least 20 of homestay owners to find out electricity consumption in homestay. The Figure 3.3 shows the methodology flow chart in order to archive first objective. The survey will focus to the respondent which is homestay owner. In this survey, there are questionnaire to be answer by the homestay owners. The questions are about electricity consumption, satisfaction of electricity bill, how many homestay they have and the attitude of the tourists.

There are some steps involve to be implemented in order to achieve the first objective. Firstly, the survey will be conducted in two ways, there are by phone and face to face. Homestay involved mostly around Kedah, Kuala Lumpur and Malacca. In Malacca, there are lots of homestay because Malacca one of the most tourism place in Malaysia. Besides, the survey also will discuss a product that will be creating and get a feedback or advice. After the data collect from the survey, it will be analyze and become a guideline to complete the project. It is because the data is important to see the pattern of the electricity consumption. In additional, the results of the survey will also be used to look at the advantages and disadvantages of this product. So, this will serve as a guide to meet the required demand. This survey will also be used to see how well this product can be used and marketed. Futhermore, this survey will continue until the project is completed. So, any deficiencies in the product will be known and can be recovered.

3.3 Methodology to Achieve Second Objective

(Design homestay power switching card system which can reduce electricity bill)

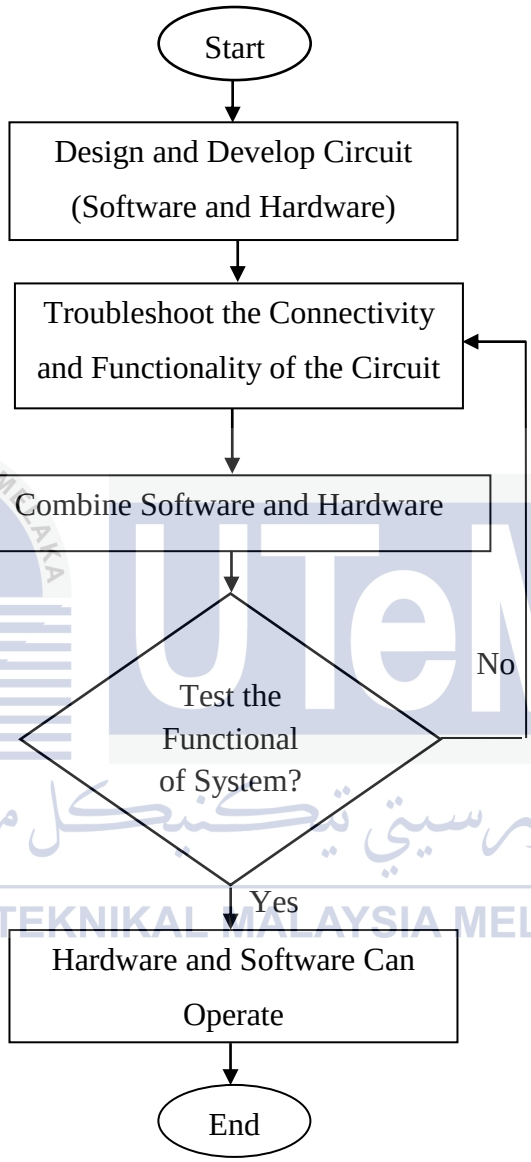

Figure 3.4: Methodology of Second Objective

The second objective is to design the product which is homestay power switching card system. This product can reduce up 20% of electricity bill every month. The Figure 3.4 shows the methodology flow chart in order to archive second objective. In this

project, the software that will be used such as Microcontroller programming and Proteus ISIS Professional. The hardware for this project used LCD, keypad 4x3, Radio Frequency Identification (RFID) reader and tag, microchip PIC 16F877A and Cytron SK40C enhanced 40 pins PIC training kit.

The microcontroller software used to write a program in order to achieve the second objective. The C Programming software that used in this project is "microC Compiler for PIC". The program is about to display the character or word, display energy usage, to key in RFID card number and to program the RFID system. Then, the program will load to ISIS Professional software to run the simulation. In this software, it can detect if there have some problems to the connection or programming. So, modification can be done at this stage before it is copied into the PIC 16F877A. The simulation process will be run repeatedly until all requirements are filled. After programming and simulation is tested, the program copied into the microchip and will be tested. If there is any dissatisfaction, it can be modified and the hardware will be trimmed. It is the last step before the product will test into homestay but testing stage must get permission from the owner. In this project, there are three programming system. The programming include in this project are:

1. Cut OFF System Program

- This program is about to energize the relay coil. This program must relate to RFID program. The relay will contact if the RFID card is inserted and vice versa.
- In this program, it have coding to be write to display character on LCD, coding for keypad press and coding for data storage.
- Actually, this is the main function program in this project. If the program is not successful, other programs cannot to proceed.

2. RFID System Program

- This program will write or read the data information that located at RFID card. Each card has own number.
- The used of this program is to verify the card number. The number of card must be exactly same to the number that saved in microcontroller chip. If number from card and number that stored in PIC do not match, the program will conclude both of number is invalid. So, the next step cannot be run.

3. Energy Meter Program

- In this energy meter program phase, it has some coding for calculation and sensor initialize. Energy meter use to measure electricity usage.
- The usage of electricity will display on LCD in kilowatt per hour (KWh). The program is implemented using microcontroller software.

3.4 Methodology to Achieve Third Objective

(To analyze the pattern of power cunsumption between private home and homestay)

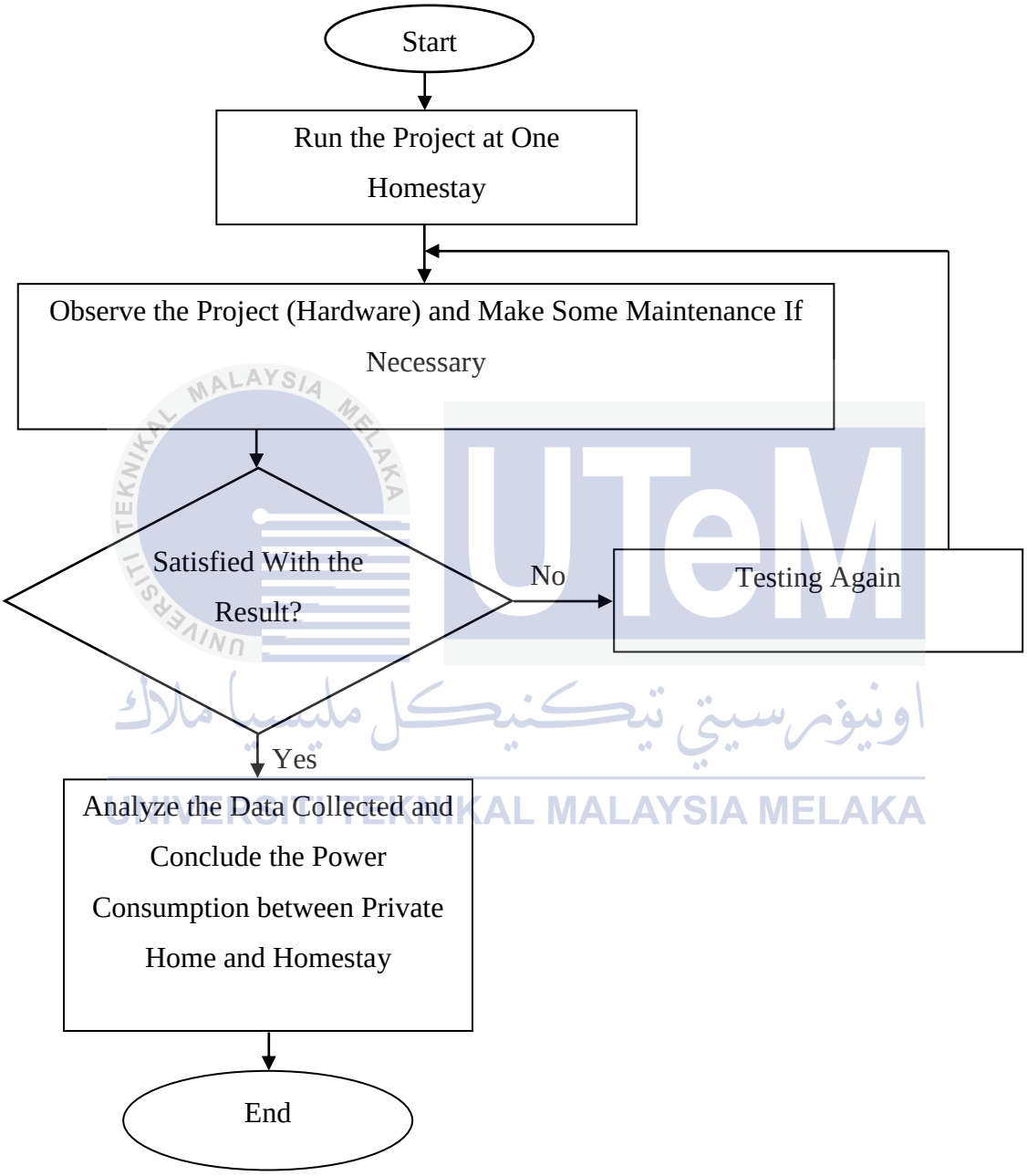

Figure 3.5: Methodology of Third Objective

The last objective is to analyze the pattern of power consumption between household and homestay using current sensor application, energy meter. The analyzing made after the data collected from the private home and homestay. Then, data used to analyze the pattern of power consumption between in private home and homestay.

The Figure 3.5 shows the flow chart of methodology steps to be implemented in order to archive the third objective. The first step is identified the homestay that will be used to test the product. Make sure the product can run without any defect. Then, the product will be observe to check either it work as desired. If there have some problem, maintenance will be performed to ensure that the product is in proper condition. After get the data and result, they will be analyzed especially the pattern of power consumption and the performance of the products. If the results are not satisfied, modifications or other method will be implemented.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Survey Part

This survey is conducted to 20 homestays owners to get the response about their electricity bill, satisfy of the electricity bills and their opinion about this project.

4.1.1 Number of Rooms in Homestay

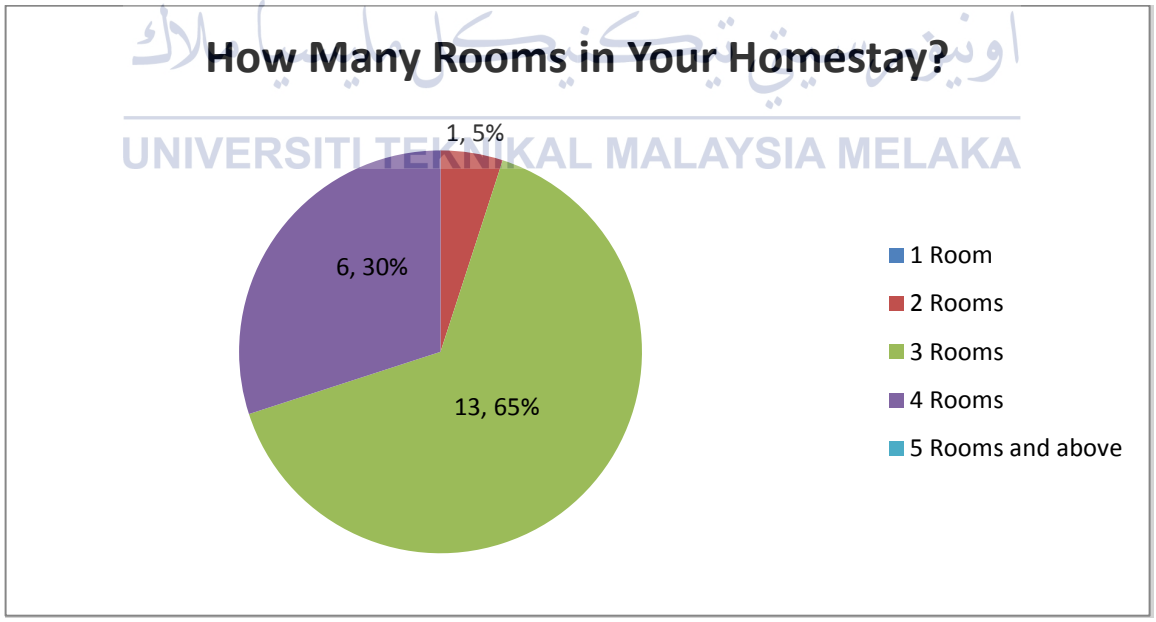

Figure 4.1: Pie Chart for Number of Rooms in Homestay

From the Figure 4.1, the pie chart shows the quantity of the rooms that have in each of the homestay that involve in this survey. Majority of the homestay have 3 rooms followed by 4 rooms and the last is 2 rooms. The homestay that has three rooms is about 13 and homestay that have 2 rooms was 1 homestay only. There have no homestay that have 1 room and 5 rooms above.

4.1.2 Number of Air Conditioners in Homestay

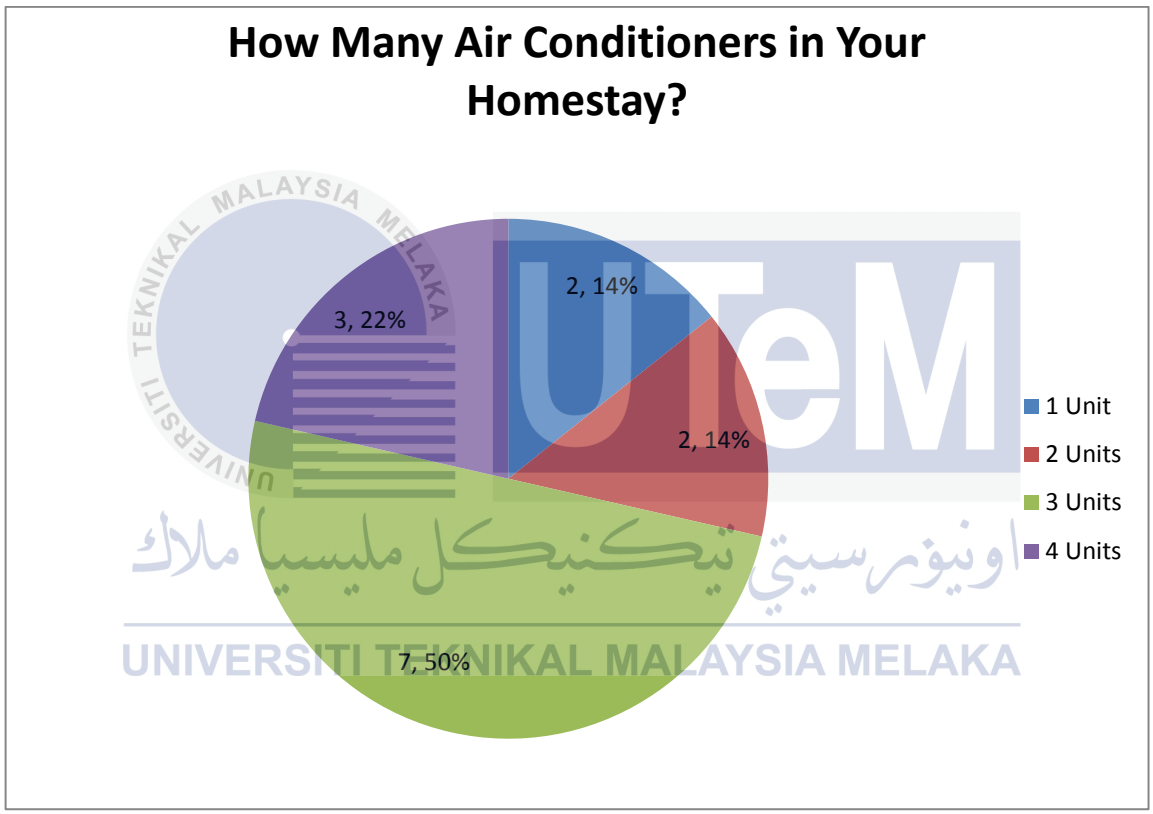

Figure 4.2: Pie Chart for Number of Air Conditioners in Homestay

From the Figure 4.2, the pie chart shows the quantity of the air conditioners that have in each of the homestay that involve in this survey. Majority of the homestay have 3 units of air conditioners followed by 4 units. Homestay that have 1 and 2 units of air conditioners is same which 2 of homestay for each. From the survey, not all the homestay owners were installing the air conditioners in their homestays.

4.1.3 Satisfaction of Electricity Bill at the Homestay

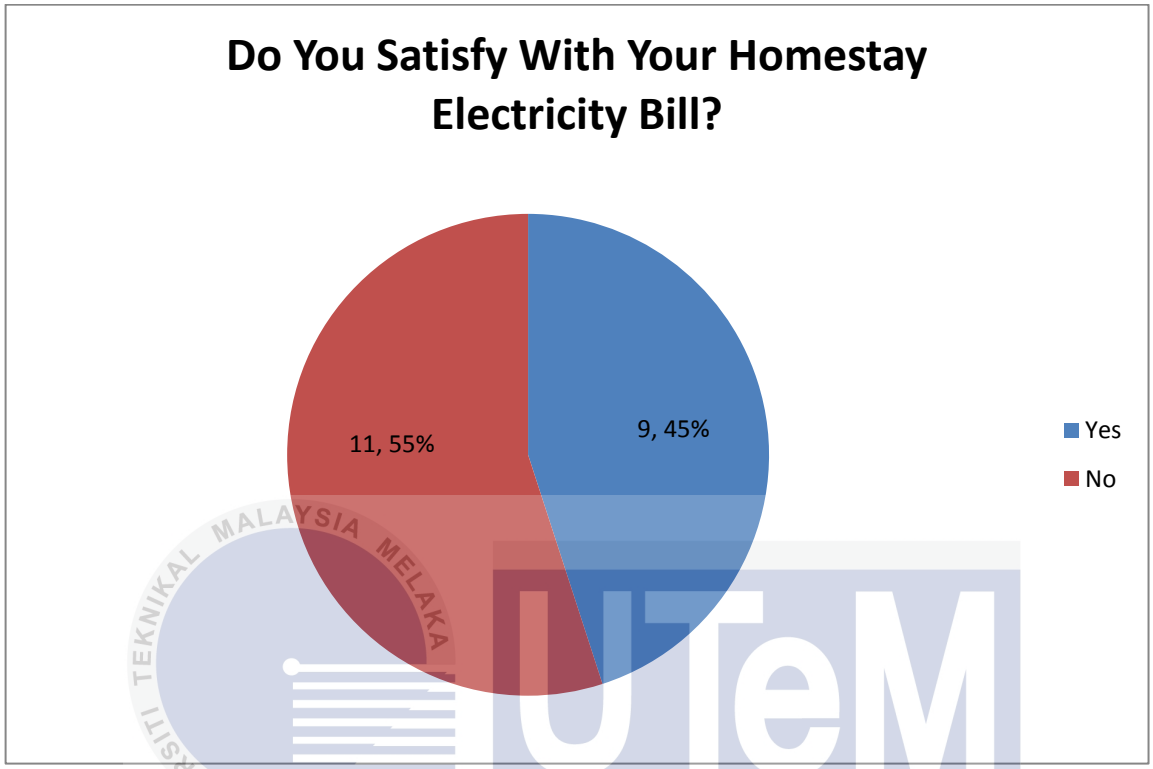

Figure 4.3: Pie Chart for Satisfaction of Electricity Bill at the Homestay

Figure 4.3 shows the pie chart of the satisfaction of electricity bills in their homestay. Majority of respondents do not satisfy with their homestay electricity because they have to pay relatively high for the bill. The homestay owners which not satisfy with their bill are 11 owners while the owners which satisfy with their bill are 9.

4.1.4 Usage of Any Energy Saver in Homestay

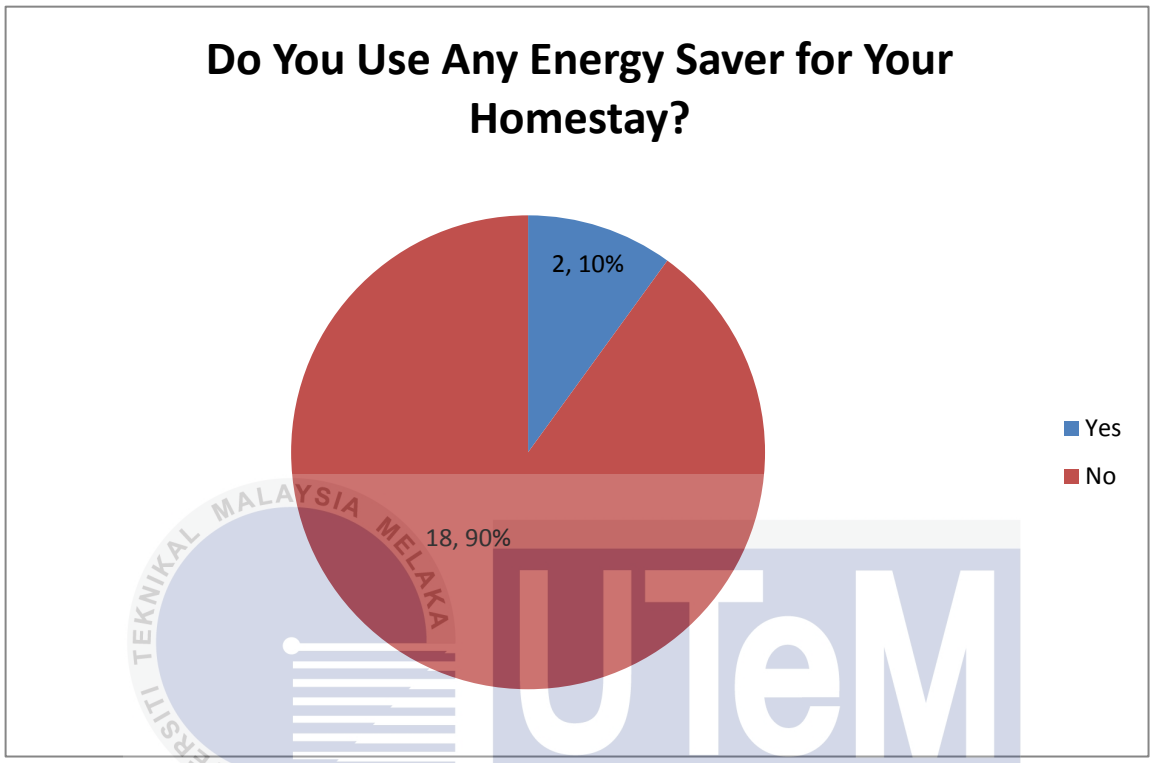

Figure 4.4: Pie Chart for Usage of Any Energy Saver in Homestay

From the Figure 4.4, the possible conclusion that can make is most of the homestay do not use any energy saver, but 2 homestays used the product of energy saver. However, the owners that used energy saver in their homestay said that energy saver do not give more effect to the electricity consumption because every months they have to paid high electricity bill too.

4.1.5 Opinion about HOPs-C Project

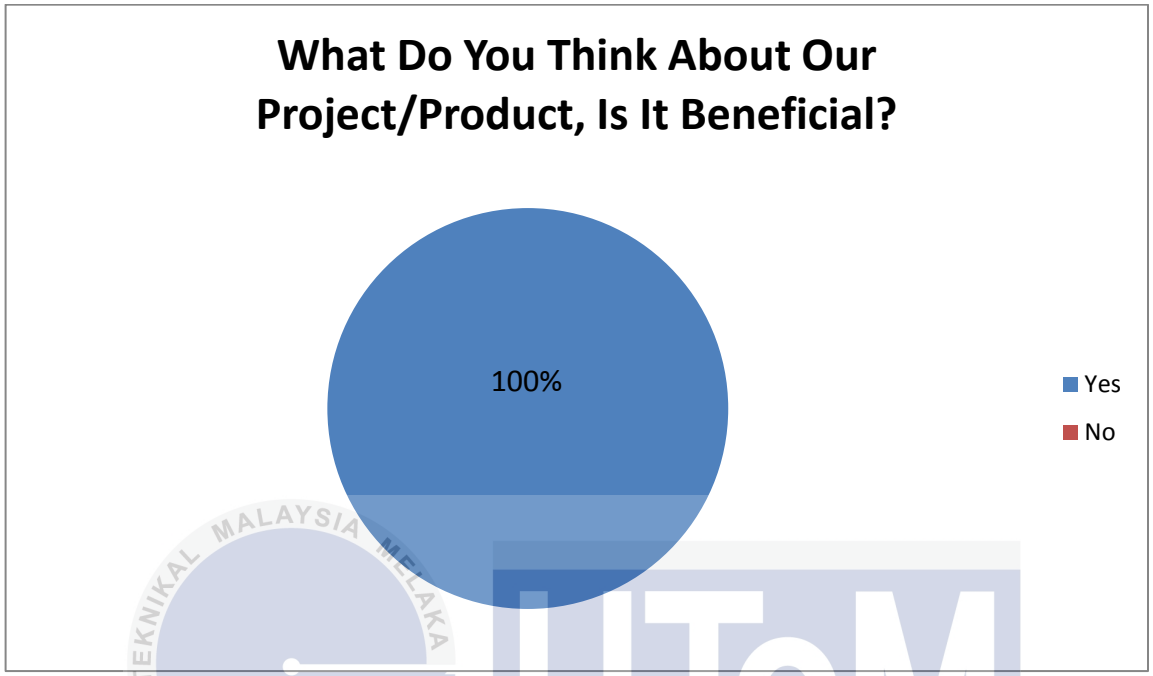

Figure 4.5: Pie Chart for Opinion about HOPs-C Project

Figure 4.5 shows all of the respondents, which is homestay owners think this project is very beneficial and will give benefits to them especially in order to reduce their electricity bill. Besides, some of respondents also suggest using this product for other use like private apartment or private home.

4.2 Simulation Result

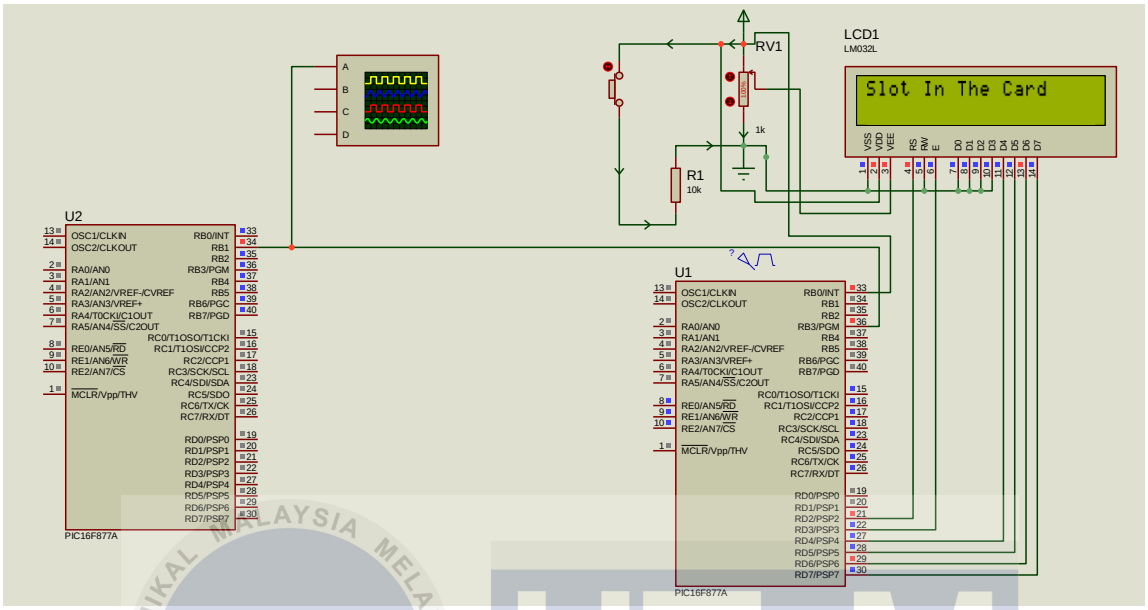

Figure 4.6: Schematic Diagram for the Project Using Proteus Software (RFID)

Before the project was run to the real-time hardware, it has to be tested first in the software. In this project, the softwares that used are Proteus and microC PRO for PIC. The uses of microC PRO for PIC is to write the program before it load to the micro controller chip. After finished of programming part, the program is uploaded to the simulation micro controller chip. Figure 4.6 shows the schematic diagram on Proteus to test the functionality of project and display the cards number. The important parts in this simulation are to display the card number on the LCD and how the micro controller will give the output. For Figure 4.7, it shows the schematic diagram for energy meter. The output parameter such as power will display on the LCD and data will store in microcontroller.

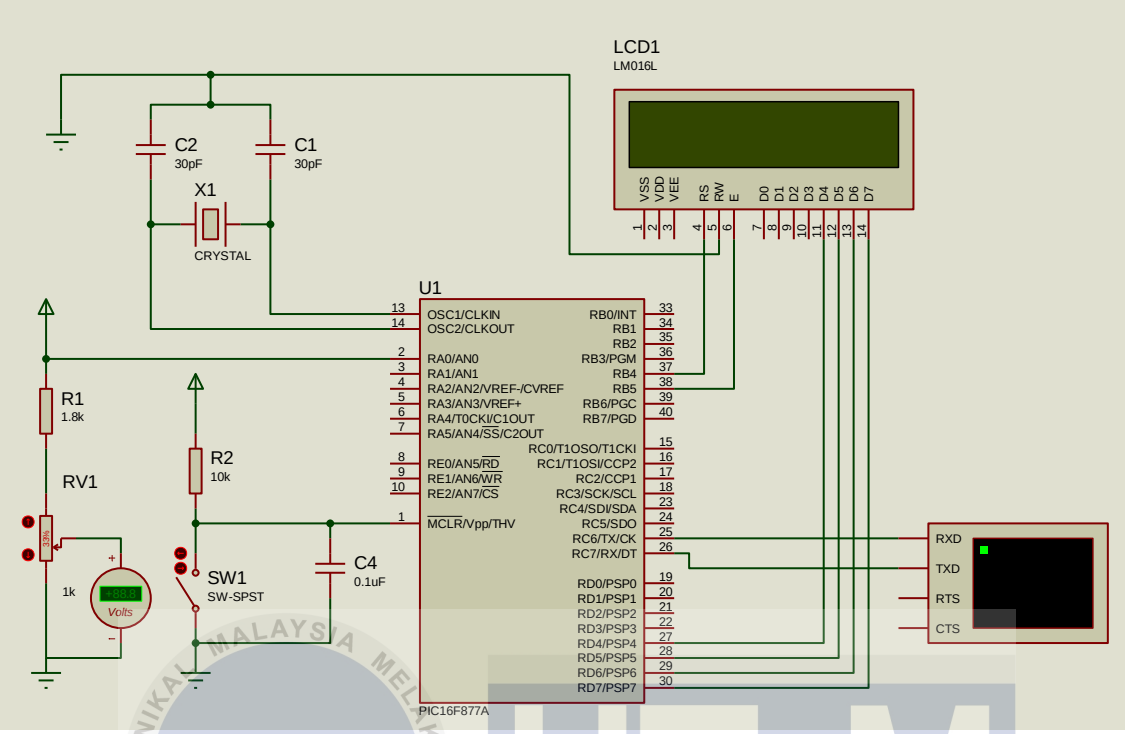

Figure 4.7: Schematic Diagram for the Project Using Proteus Software (Energy Meter)

4.3 Hardware Development

Figure 4.8: Lighting Conditions Before the System Is Turned ON

Figure 4.8 shows the lighting condition before the system is turned on. To turn ON the system, the valid card has to insert into the card holder. The lamp is still not light up though the switch in turn ON, it is because the system is still in low condition until system energize the contactor when there has the valid card in the card holder. For the Figure 4.9 is the picture of the LCD display for the system. The LCD will always display the word “Slot in the Card” if there are no card in the card holder. So, this indicator is easily for tourist to turn ON the power supply in the homestay.

Figure 4.9: LCD Display When There Are No Card Inserted

Figure 4.10 shows the LCD display when invalid card was inserted into the RFID tag. When the wrong card is inserted into the card holder, the LCD will display the word "Warning! Invalid". That means, the card that you used to slot in into the card holder is invalid. So, the system does not turn ON the power supply. This is the security function for using this RFID system. The tourist cannot use another card than the card that given by the homestay owners.

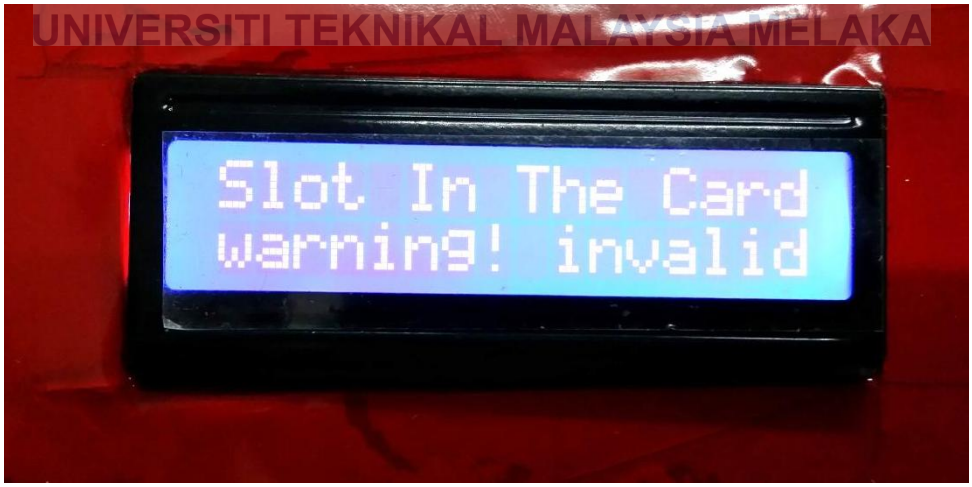

Figure 4.10: LCD Display When Wrong/Invalid Card Inserted

Figure 4.11: LCD Display When Valid Card Inserted

Figure 4.12: Lighting Conditions After the System Is Turned ON

When the valid card is slot into the card holder, the LCD will display "WELCOME", like the Figure 4.11. The system will turn ON the power supply and it will trigger the contactor to allow all the electrical appliances in the homestay to be use. Figure 4.12 shows the example of the electrical appliances is turned ON when the system is allow the electricity to flow. In the prototype module, the lamp will represent all of the electrical appliances in the homestay.

Figure 4.13: LCD Display of Energy Meter

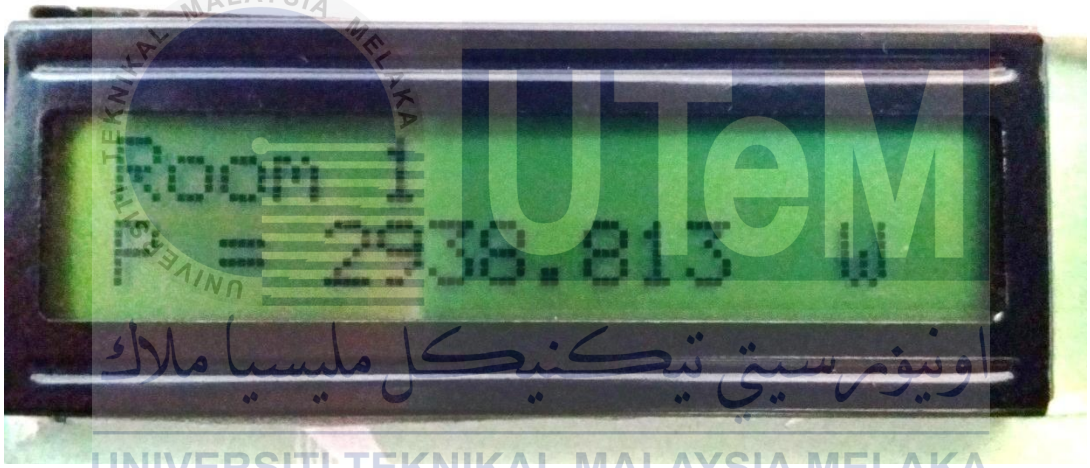

Figure 4.14: LCD Display of Power Consumption

Figure 4.13 and 4.14 show the power consumption at the certain time. The value will decrease and increase depends on the electrical appliances that used. Current sensor will capture the energy and the convert to power before it display on LCD. So, the homestay owner can see the power that consume at that time they see the LCD. In additional, it also makes owners or other person easy to see the power consumption because the display in digital.

4.4 Analysis of the Electric Power Consumption

Table 4.1: Electric Power Consumption in Private Home

Time	Power Consumption(Watt)
07.00-08.00	2420
08.00-09.00	1565
09.00-10.00	1562
10.00-11.00	1565
11.00-12.00	2000
12.00-13.00	2340
13.00-14.00	2481
14.00-15.00	2105
15.00-16.00	2582
16.00-17.00	2650
17.00-18.00	2430
18.00-19.00	2348
19.00-20.00	2762
20.00-21.00	2660
21.00-22.00	1695
22.00-23.00	1762
23.00-24.00	1532
00.00-01.00	1430
01.00-02.00	1415
02.00-03.00	2340
03.00-04.00	2341
04.00-05.00	2340
05.00-06.00	2342
06.00-07.00	2341

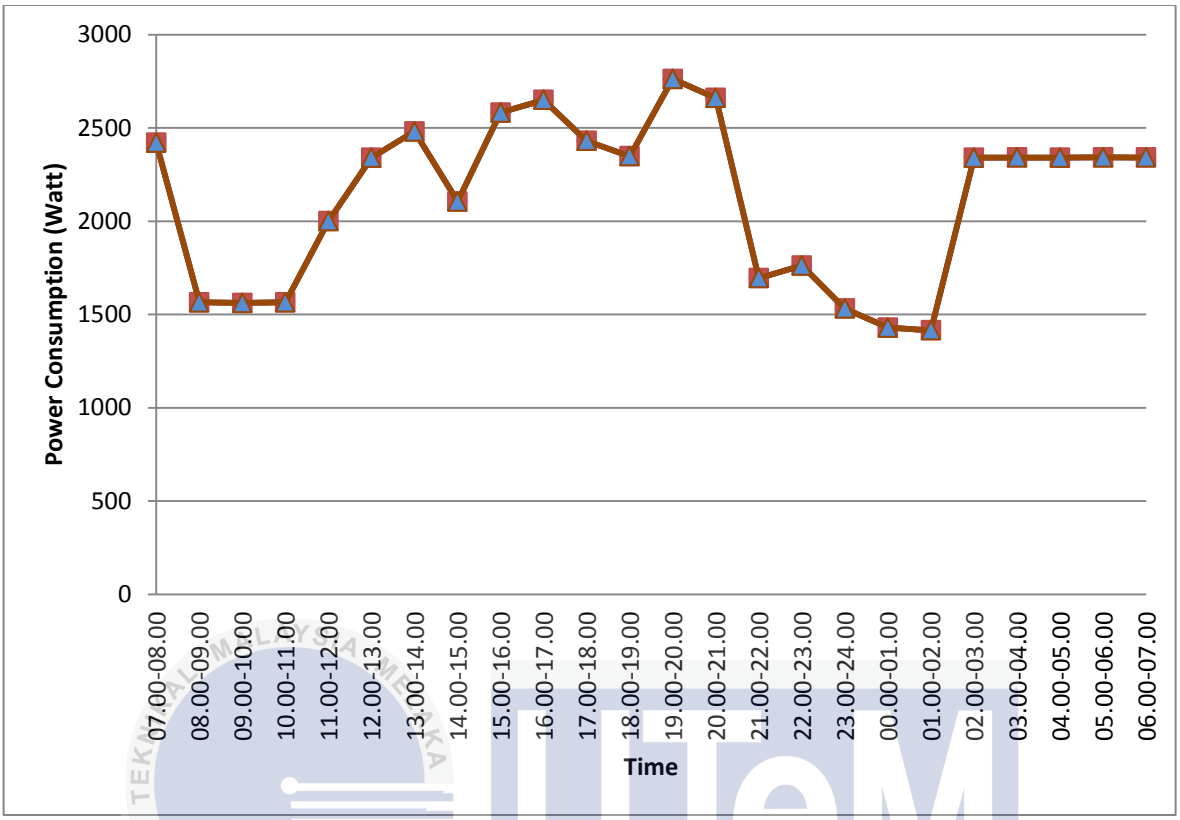

Figure 4.15: Power Consumption in Private Home

In private home, the electricity power consumption is not consistent at all hours. Sometime power consumption at high level, means at that time there are many electrical appliances is used. Figure 4.15 shows the pattern of power consumption for whole day in private home. At midnight until morning, the electricity power consumption consistent at 2340 watts because it is bedtime. Electricity consumption at that time also quite high because there has an air conditioner in the house and lasted for 6 hours. Graph also shows the lack of electricity consumption in the morning because at that time there is less activity that used electrical appliances. Peak hour of power consumption in the house is at noon. This because at the time, a lot of electrical appliances used especially for cook, watch television, surf internet and use heavy equipment. Activity is very less in the evening and the use of electricity at the time focused on the television and fan. At night to midnight, the graph shows the pattern of power consumption in private home decrease due to less of electrical appliances operated within that time. The main

electrical appliances that use at that time are fluorescent lamp, television and fan. Graph consistently at bed time due to the use of air conditioners and some fans continuously without other electrical appliances used. This pattern of power consumption not same for every day and vary according to the use of electrical appliances itself. It is also different when compared between weekdays and weekends.

Table 4.2: Electric Power Consumption in Homestay, Day 1

Time	Power Consumption (Watt)
07.00-08.00	2175
08.00-09.00	2060
09.00-10.00	2092
10.00-11.00	2026
11.00-12.00	800
12.00-13.00	802
13.00-14.00	801
14.00-15.00	802
15.00-16.00	802
16.00-17.00	800
17.00-18.00	801
18.00-19.00	800
19.00-20.00	802
20.00-21.00	802
21.00-22.00	800
22.00-23.00	3190
23.00-24.00	3142
00.00-01.00	4070
01.00-02.00	3328
02.00-03.00	3328
03.00-04.00	2950

04.00-05.00	2910
05.00-06.00	2912
06.00-07.00	2911

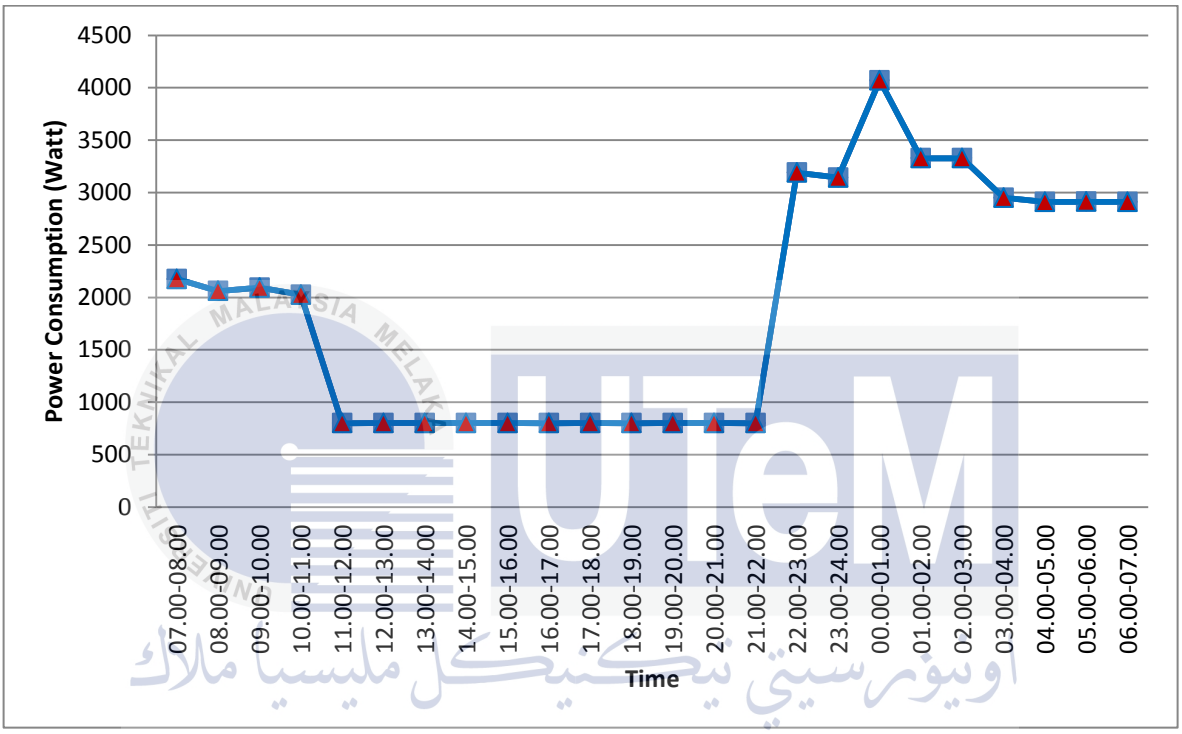

Figure 4.16: Power Consumption in Homestay for Day 1

Table 4.3: Electric Power Consumption in Homestay, Day 2

Time	Power Consumption (Watt)
07.00-08.00	3140
08.00-09.00	3822
09.00-10.00	2090
10.00-11.00	2095
11.00-12.00	800
12.00-13.00	802

13.00-14.00	800
14.00-15.00	800
15.00-16.00	801
16.00-17.00	802
17.00-18.00	800
18.00-19.00	3225
19.00-20.00	3320
20.00-21.00	3850
21.00-22.00	800
22.00-23.00	800
23.00-24.00	801
00.00-01.00	800
01.00-02.00	4112
02.00-03.00	4110
03.00-04.00	3175
04.00-05.00	3123
05.00-06.00	3120
06.00-07.00	3124

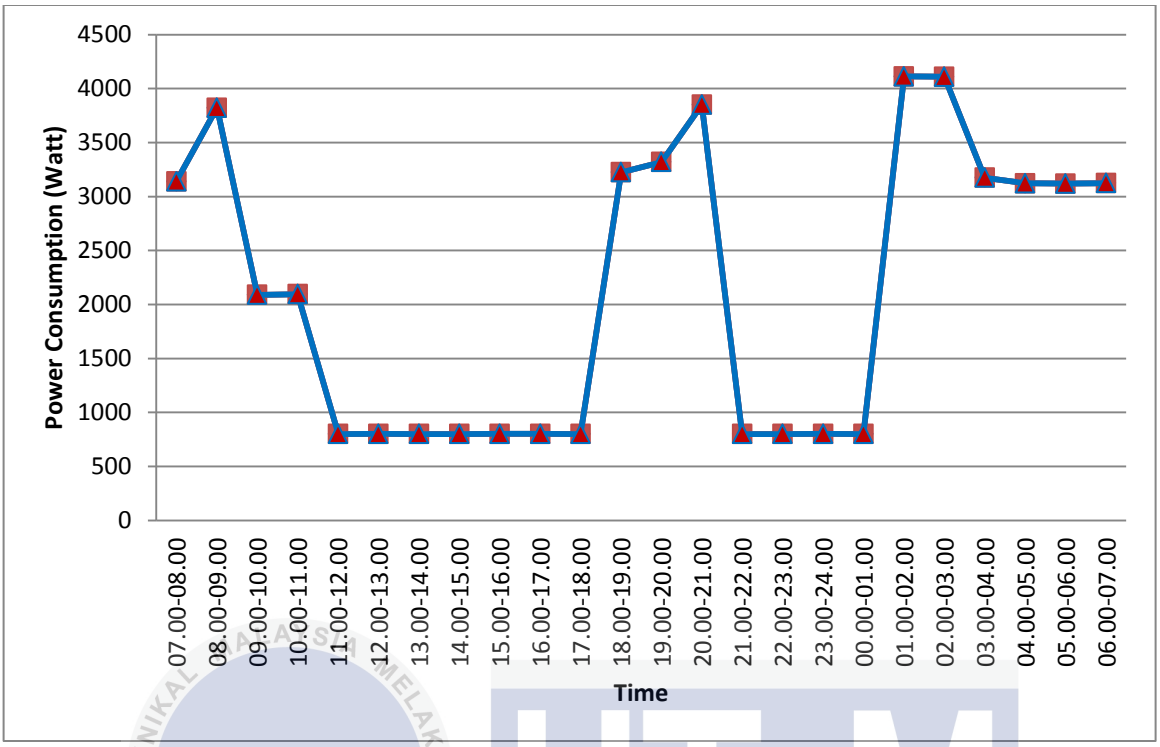

Figure 4.17: Power Consumption in Homestay for Day 2

The electricity power consumption in homestay is slightly different to private home. This is due to lack of electrical appliances that uses a high power (wattage) and the little amount of electrical appliances in the homestay. Figure 4.16 shows the pattern of power consumption for day 1 and Figure 4.17 shows the pattern for day 2. In this homestay, refrigerator will work for 24 hours non-stop because the refrigerator does not connected to the homestay power switching card system. When tourists leave the homestay, all electrical appliances will switch OFF except refrigerator and it used more or less 800 watts. The graph remains consistent because only the refrigerator used when there are no people in the homestay. At time 6.00 PM to 8.00 PM on the day two, there are some electrical appliances used at that time because the graph shows the increase of power consumption. That means there are tourists in the homestay within that time. The peak time of power consumption different between at homestay and private home because electricity consumption of the homestay is height at night while at private home during the day. This is because visitors will be out during the day and going home to relax and get rest at night. At midnight to morning, the electricity consumption is very

high due to the use of two air conditioners in that homestay. Air conditioning, television and ceiling fans are among the most commonly used electrical appliances in homestay. Compare to private homes, the use of high electricity in the house during the day because there are a lot of activities that require using many electrical appliances at the same time. In addition, the electrical appliances in the home are also using high electrical power. When viewed at the pattern of electricity consumption in the homestay, it is more on the use of air conditioner where the air conditioner using high power. This problem will cause the increase of the electric bill in the Homestay. So, HOPs-C invented in order is to switch OFF the electrical appliances, especially air conditioner when there are no tourist in the honesty and only allow the refrigerator to operate for 24 hours. The use of HOPs-C can control electricity consumption better, more efficient and able to control the wastage of electricity.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This project is about to design a hardware named Homestay Power Switching Card System (HOPs-C) and focused to the homestay industry in Malaysia. This project used Radio Frequency Identification (RFID) system. RFID system more secure because each of RFID cards have their own unique characteristic number. Tourists or consumer cannot change the RFID card with another card because RFID reader can only read the card number that store in its memory.

This project began by conducting a survey to the Homestay owners in Malaysia, especially around Kedah, Malacca and Kuala Lumpur. From the survey, all of the homestay owners agree with this project in order to reduce the power consumption in their homestay. Most of the homestay owners, do not use any electric saver or system that can cut OFF the electricity supply when there are no people in the homestay. They also agree that this product will benefit to them and be able to increase their income.

Most homestays with a high electric bill is because they are using the air conditioners. This is because the air conditioners consume high power compare to other electrical appliances. Other than that, power consumption in homestay also differ compare the power consumption in private home because homestay used more electricity at night while private home higher power consumption at daytime.

As a conclusion, this product is the convenient solution to reduce massive amount of unused energy consumption in homestay and promoting energy saving awareness to the tourist. Cheapest price in the market makes this product affordable for purchase and can be used in the homestay. This product can cut OFF the electricity supply easier by removed the card from the card slot and the tourist no need to check whether some electrical appliances was turned OFF or not.

5.2 Recommendation

For the recommendation, there are a lot improvement can be made in especially in term of security features to this product. This product must be implementing with safety features to prevent lightning strikes. This is to ensure the safety of the product itself and the safety of others electrical appliance in the homestay. Product lifespan may also can be consider for the future development. Other than that, this product can also be improved by testing the product in a homestay for a few months and get the data to be analysed. This is to ensure the quality and impact of the use of this product. This Homestay Power Switching Card System (HOPs-C) can be upgraded and made more neat and tidy before it can be marketed.

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APPENDIX

A) BORANG KAJI SELIDIK

PENGGUNAAN TENAGA ELEKTRIK DI HOMESTAY (INAP DESA)

Nama Pengusaha : _____

Alamat/Nama Homestay : _____

Nombor Tel : _____

Email : _____

1. Berapa buahkan homestay yang anda miliki?

   A. 1 buah
   B. 2 buah
   C. 3 buah
   D. 4 buah
   E. 5 buah dan ke atas

Soalan 2 hingga 7 hanya berdasarkan purata untuk sebuah homestay.

2. Dalam sebulan, berapa kalikah pelancong akan datang menginap di homestay anda?

   A. 1 kali
   B. 2 kali
   C. 3 kali
   D. 4 kali
   E. 5 kali dan ke atas

3. Berapa harikah pelancong akan menginap di homestay anda untuk sekali tempoh menginap?

   A. 1 hari
   B. 2 hari
   C. 3 hari
   D. 4 hari
   E. 5 hari dan ke atas

4. Berapakah jumlah bilik tidur yang terdapat di dalam homestay anda?
   A. 1 bilik
   B. 2 bilik
   C. 3 bilik
   D. 4 bilik
   E. 5 bilik dan ke atas

5. Isi ruangan di bawah. Jadual di bawah adalah berkaitan dengan jumlah penghawa dingin dan kipas angin.

Bilik	Jumlah Penghawa Dingin	Kuasa Kuda Penghawa Dingin (H/P)	Jumlah Kipas Angin
1			
2			
3			
4			
5			
6			

6. Berapakah anggaran kadar penggunaan di homestay anda untuk sebulan?
   A. RM 0 – RM 43.6 (200 kWh pertama)
   B. RM 43.7 – RM 77 (100 kWh berikutnya)
   C. RM 77.1 – RM 117 (100 kWh berikutnya)
   D. RM 117.1 – RM 157.2 (100 kWh berikutnya)
   E. RM 157.3 – RM 198.8 (100 kWh berikutnya)
   F. RM 198.9 – RM 241.4 (100 kWh berikutnya)
   G. RM 241.5 – RM 285.1 (100 kWh berikutnya)
   H. RM 285.2 – RM 330.4 (100 kWh berikutnya)
   I. RM 330.5 dan ke atas (100 kWh berikutnya dan ke atas)

7. Adakah anda berpuas hati dengan kadar penggunaan di homestay anda sekarang?

   A. Ya
   B. Tidak.Nyatakan mengapa._____

8. Adakah anda menggunakan sebarang alat untuk menjimatkan penggunaan tenaga elektrik di homestay anda?

   A. Ya. Nyatakan alat tersebut._____
   B. Tidak

9. Adakah anda rasa pelancong yang menginap di homestay anda akan mematikan suis alatan elektrik apabila mereka tiada di dalam homestay?

   A. Ya
   B. Tidak

   Jika **TIDAK**, adakah anda berpuas hati dengan cara penggunaan seperti itu?

   A. Ya
   B. Tidak

10. Adakah anda rasa perlu untuk memutuskan keseluruhan alatan elektrik di dalam homestay anda sekiranya pelancong tiada di dalam homestay?

    A. Ya
    B. Tidak

11. Adakah anda rasa alat/projek yang akan dicipta ini bermanfaat dan dapat membantu untuk mengawal kadar penggunaan tenaga elektrik di homestay anda?

    A. Ya
    B. Tidak

12. Jika alat/projek ini sudah siap, adakah anda akan memberi peluang kepada kami untuk menguji alat/projek ini di dalam homestay anda untuk tempoh selama 1 atau 2 bulan?

    A. Ya
    B. Tidak

13. Selain itu, adakah anda sudi untuk menghulurkan apa-apa bantuan untuk menjayakan projek ini?

    A. Ya
    B. Tidak

    Jika **YA**, nayatakan apakah jenis sumbangan tersebut.

    _____

14. Jika anda mempunyai apa-apa cadangan, sila nyatakan.

    _____

    Tandatangan Untuk Pengesahan:_____
    ( )

"TERIMA KASIH ATAS KERJASAMA ANDA"

B) Coding for RFID System

```
// ----------------------LCD module connections
sbit LCD_RS at RD2_bit;
sbit LCD_EN at RD3_bit;
sbit LCD_D4 at RD4_bit;
sbit LCD_D5 at RD5_bit;
sbit LCD_D6 at RD6_bit;
sbit LCD_D7 at RD7_bit;

sbit LCD_RS_Direction at TRISD2_bit;
sbit LCD_EN_Direction at TRISD3_bit;
sbit LCD_D4_Direction at TRISD4_bit;
sbit LCD_D5_Direction at TRISD5_bit;
sbit LCD_D6_Direction at TRISD6_bit;
sbit LCD_D7_Direction at TRISD7_bit;
//========================================
unsigned long int cycle_counter = 0, login=0, login_attemp=0, relay=0;
char RFID[8], RFID_actual[8]="3FFFFFF", txt1[6]="abcde", txt2[6];
```



```
void main()
{
  // ----------------------------------------Initialize LCD
  Lcd_Init();
  Delay_ms(500);
  Lcd_Cmd(_LCD_CLEAR);               // Clear display
  Delay_ms(500);
  Lcd_Cmd(_LCD_CURSOR_OFF);          // Cursor off
  Delay_ms(500);
  //=====================================================
```

```
// procees of taking initial value from EEPROM
    if(EEPROM_Read(0x06)== 0xFF)
 {
  EEPROM_Write(0x06, 0x01);
  EEPROM_Write(0x80, 0x01);
  EEPROM_Write(0x81, 0x01);
  EEPROM_Write(0x82, 0x01);
  EEPROM_Write(0x83, 0x01);
  EEPROM_Write(0x84, 0x01);
  EEPROM_Write(0x85, 0x01);
  EEPROM_Write(0x86, 0x01);
 }
 else
 {
  RFID_actual[0] = EEPROM_Read(0x80);
  RFID_actual[1] = EEPROM_Read(0x81);
  RFID_actual[2] = EEPROM_Read(0x82);
  RFID_actual[3] = EEPROM_Read(0x83);
  RFID_actual[4] = EEPROM_Read(0x84);
  RFID_actual[5] = EEPROM_Read(0x85);
  RFID_actual[6] = EEPROM_Read(0x86);
 }
 //====================================
 // ------------------------------Initialize port to be used
 TRISC = 0x00;
 PORTC = 0;
 TRISB = 0xFF;
 PORTB = 0;
 TRISE = 0;
 PORTE = 0;
 //=====================================================
```

```
while(1)
{
Lcd_Cmd(_LCD_CLEAR);              // Clear display
Lcd_Out(1, 1, "Slot In The Card");

if (login==1)
  {
   PORTE.f0=1;
   Lcd_Cmd(_LCD_CLEAR);              // Clear display
   Lcd_Out(1, 1, "   WELCOME!!!");
   login_attemp=0;
  }
  else
  {
   PORTE.f0=0;
  }
  relay=1;


if (login_attemp==1)
  {
   Lcd_Out(2, 1, "warning! invalid card");
  }
  else
  {
  }

if (PORTB.f1==1 && login==1)
{
relay=0;
```

```
}
else
{
}

login_attemp=0;
PORTC=0;
login=0;

if(PORTB.f1==0)
{
while (PORTB.f1==0)
{
}
relay=0;
Delay_ms(10000);
Delay_ms(5000);
}
else
{
}
 //=====================================
while(PORTB.f3==1 && PORTB.f0==1 && relay==1)
{
}

 PORTC.f1=PORTB.f3;
delay_us(2325);
 PORTC.f0=PORTB.f3;
delay_us(2325);
 RFID[0]=PORTC+0x30;
```

```
// delay_us(2350);
  PORTC.f3=PORTB.f3;
 delay_us(2325);
  PORTC.f2=PORTB.f3;
 delay_us(2325);
  PORTC.f1=PORTB.f3;
 delay_us(2325);
  PORTC.f0=PORTB.f3;
 delay_us(2325);
  RFID[1]=PORTC+0x30;

// delay_us(2350);
  PORTC.f3=PORTB.f3;
 delay_us(2325);
  PORTC.f2=PORTB.f3;
 delay_us(2325);
  PORTC.f1=PORTB.f3;
 delay_us(2325);
  PORTC.f0=PORTB.f3;
 delay_us(2325);
 RFID[2]=PORTC+0x30;

 //delay_us(2350);
   PORTC.f3=PORTB.f3;
 delay_us(2325);
  PORTC.f2=PORTB.f3;
 delay_us(2325);
  PORTC.f1=PORTB.f3;
 delay_us(2325);
  PORTC.f0=PORTB.f3;
```

```
 delay_us(2325);
  RFID[3]=PORTC+0x30;

// delay_us(2350);
    PORTC.f3=PORTB.f3;
 delay_us(2325);
  PORTC.f2=PORTB.f3;
 delay_us(2325);
  PORTC.f1=PORTB.f3;
 delay_us(2325);
  PORTC.f0=PORTB.f3;
 delay_us(2325);
  RFID[4]=PORTC+0x30;

// delay_us(2350);
    PORTC.f3=PORTB.f3;
 delay_us(2325);
  PORTC.f2=PORTB.f3;
 delay_us(2325);
  PORTC.f1=PORTB.f3;
 delay_us(2325);
  PORTC.f0=PORTB.f3;
 delay_us(2325);
  RFID[5]=PORTC+0x30;

// delay_us(2350);
   PORTC.f3=PORTB.f3;
 delay_us(2325);
  PORTC.f2=PORTB.f3;
 delay_us(2325);
  PORTC.f1=PORTB.f3;
```

```
 delay_us(2325);
  PORTC.f0=PORTB.f3;
 delay_us(2325);
  RFID[6]=PORTC+0x30;

  if (PORTB.f0==0)
  {
    Lcd_Cmd(_LCD_CLEAR);               // Clear display
    Lcd_Out(1, 1, "NEW ID PLEASE");
    while(PORTB.f0==0)
    {
    Delay_ms(100);
    }

PORTC=0;
  //=====================================
while(PORTB.f3==1 && PORTB.f0==1)
{
}

  if(PORTB.f0==1)
  {
  PORTC.f1=PORTB.f3;
 delay_us(2325);
  PORTC.f0=PORTB.f3;
 delay_us(2325);
  RFID_actual[0]=PORTC+0x30;


  PORTC.f3=PORTB.f3;
 delay_us(2325);
```

```
 PORTC.f2=PORTB.f3;
delay_us(2325);
 PORTC.f1=PORTB.f3;
delay_us(2325);
 PORTC.f0=PORTB.f3;
delay_us(2325);
 RFID_actual[1]=PORTC+0x30;

 PORTC.f3=PORTB.f3;
delay_us(2325);
 PORTC.f2=PORTB.f3;
delay_us(2325);
 PORTC.f1=PORTB.f3;
delay_us(2325);
 PORTC.f0=PORTB.f3;
delay_us(2325);
RFID_actual[2]=PORTC+0x30;

  PORTC.f3=PORTB.f3;
delay_us(2325);
 PORTC.f2=PORTB.f3;
delay_us(2325);
 PORTC.f1=PORTB.f3;
delay_us(2325);
 PORTC.f0=PORTB.f3;
delay_us(2325);
 RFID_actual[3]=PORTC+0x30;


   PORTC.f3=PORTB.f3;
delay_us(2325);
```

```
 PORTC.f2=PORTB.f3;
delay_us(2325);
 PORTC.f1=PORTB.f3;
delay_us(2325);
 PORTC.f0=PORTB.f3;
delay_us(2325);
 RFID_actual[4]=PORTC+0x30;


   PORTC.f3=PORTB.f3;
delay_us(2325);
 PORTC.f2=PORTB.f3;
delay_us(2325);
 PORTC.f1=PORTB.f3;
delay_us(2325);
 PORTC.f0=PORTB.f3;
delay_us(2325);
 RFID_actual[5]=PORTC+0x30;

  PORTC.f3=PORTB.f3;
delay_us(2325);
 PORTC.f2=PORTB.f3;
delay_us(2325);
 PORTC.f1=PORTB.f3;
delay_us(2325);
 PORTC.f0=PORTB.f3;
delay_us(2325);
 RFID_actual[6]=PORTC+0x30;

  cycle_counter=0;
  while(cycle_counter<7)
```

```
 {
 if(RFID_actual[cycle_counter]>57)
 {
 RFID_actual[cycle_counter]=RFID_actual[cycle_counter]+7;
 }
 else
 {
 }

 cycle_counter=cycle_counter+1;
 }

  EEPROM_Write(0x80, RFID_actual[0]);
  EEPROM_Write(0x81, RFID_actual[1]);
  EEPROM_Write(0x82, RFID_actual[2]);
  EEPROM_Write(0x83, RFID_actual[3]);
  EEPROM_Write(0x84, RFID_actual[4]);
  EEPROM_Write(0x85, RFID_actual[5]);
  EEPROM_Write(0x86, RFID_actual[6]);

  Lcd_Cmd(_LCD_CLEAR);               // Clear display
  Lcd_Out(1, 1, "NEW ID NUMBER :");
  Lcd_Out(2, 2, RFID_actual);
  Delay_ms(2000);
  }
  else
  {
  }
}
 else
 {
```

```
 login=1;
 cycle_counter=0;
while(cycle_counter<7)
{
if(RFID[cycle_counter]>57)
{
RFID[cycle_counter]=RFID[cycle_counter]+7;
}
else
{
}

if(RFID[cycle_counter]==RFID_actual[cycle_counter])
{
 login=login*1;
}
else
{
login=login*0;
}

 cycle_counter=cycle_counter+1;
}



Lcd_Cmd(_LCD_CLEAR);               // Clear display
Lcd_Out(1, 1, "ID NUMBER:");
Lcd_Out(1, 11, RFID);
```

```
  if(relay==0)
  {
  }
  else
  {
   login_attemp=1;
  }
  Delay_ms(2000);

  while(PORTB.f0==0)
    {
    Delay_ms(100);
    }
// END
```

C) Coding for Energy Meter

```
// Lcd Connections
sbit LCD_RS at RB4_bit;
sbit LCD_EN at RB5_bit;
sbit LCD_D4 at RD4_bit;
sbit LCD_D5 at RD5_bit;
sbit LCD_D6 at RD6_bit;
sbit LCD_D7 at RD7_bit;

// Pin direction
sbit LCD_RS_Direction at TRISB4_bit;
sbit LCD_EN_Direction at TRISB5_bit;
sbit LCD_D4_Direction at TRISD4_bit;
sbit LCD_D5_Direction at TRISD5_bit;
sbit LCD_D6_Direction at TRISD5_bit;
sbit LCD_D7_Direction at TRISD7_bit;
```



```
unsigned long value;
float voltVal;
float ampVal;
float ampRms;
float powVal;
int count, peakvalue;
char dispStr[13];

void main()
{
adcon 1=0x80;
trisa=0xff;
```

```
trisb=0x00;
portb=0x00;
Lcd_Init();
Lcd_Cmd(_Lcd_Cursor_off);
Adc_init();
UART1_Init(9600);
delay_ms(100);
peakvalue=0;

Lcd_Out(1,1, "Room 1");
Lcd_Out(2,1," P =");
Delay_ms(2000);

while(1)
{
fpr(count=0;count<500;count++)
{value=adc_read(0);
if (value>peakvalue)
{peakvalue=value;}
}

// calculation
voltVal=peakvalue*5.0/1024;
if(voltVal>2.4955)
{ampVal=(voltVal-2.4955);
ampVal=ampVal/0.03325;
ampRms=ampVal/1.4142;
}

else
{ampVal=0;ampRms=0;}
```

```
powVal=(240.0*ampRms);

//send current value
floattostr(ampRms,dispStr);
UART1_Write('1');
UART1_Write_Text(dispStr);
UART1_Write_Text("\n");
delay_ms(100);

//send power value
floattostr(powVal, dispStr);
UART1_Write('2');
UART1_Write_Text(dispStr);
UART1_Write_Text("\n");
delay_ms(100);

//display power
floattostr(powVal, dispStr);
Lcd_Cmd(_Lcd_clear);
Lcd_Out(1,1, "P=");
Lcd_Out(1,5, dispStr);
Lcd_Out(1,16, "W");
delay_ms(1500);

peakvalue=0;
ampRms=0;
ampVal=0;
}

}
//end
```

D) UteMEX Silver Certificate