ABSTRACT

The purpose of this study is to design and construct a LED lamp that will give uniform illumination. The trigonometric model was used to estimate the distribution of output light over the display area. In this study, thirteen white LEDs were used and each of them has been tested to observe the intensity profile pattern. Using LEDs with similar output pattern, the LED lamp with thirteen LEDs was build and supplied with a voltage of 3.0 V. A trigonometric model was introduced and the distribution of illuminance for a single LED was calculated. The data from the single LED was used as a reference to estimate the resultant illuminance of thirteen LEDs. Finally, the result shows that the total of illuminance for thirteen LEDs is 171 lux at the center of investigation area. It was compared to the illuminance that was directly measured from the set of thirteen LEDs which gives a value of 162 lux. The discrepancy from the predicted value is due to the assumption made in the model.

ABSTRAK

Tujuan kajian ini dilakukan adalah untuk mereka dan membina satu lampu LED yang akan memberikan pencahayaan yang seragam. Satu model trogonometri digunakan untuk menganggar taburan cahaya yang dihasilkan pada suatu kawasan. Dalam kajian ini, sebanyak tiga belas LED digunakan dan setiap satunya diuji untuk memerhati corak profil keamatannya. Dengan menggunakan LED yang corak keluaran yang sama, satu lampu dengan tiga belas LED dibinadan dibekalkan kuasa voltan sebanyak 3.0 V. Satu model trigonometri diperkenalkan dan taburan kecahayaan untuk satu LED dikira. Data daripada satu LED ini digunakan sebagai rujukan untuk menganggar jumlah kecahayaan tiga belas LED. Akhirnya, keputusan menunjukkan bahawa jumlah kecahayaan untuk tiga belas LED 171 lux pada titik kawasan yang dikaji. Ia dibandingkan dengan kecahayaan yang diukur secara terus dari set lampu LED yang mana memberikan nilai 162 lux. Perbezaan daripada nilai yang diramal disebabkan oleh anggapan yang dibuat dalam model.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 Introduction

Lighting makes a change in feelings about our home. It will perform tasks more easily and more comfortably. By using a specific lighting technique, beautiful lighting arrangement will be determined. It will also give the uniform and effective illumination. Thus, it will affect the energy consumption [12]. Lighting also includes both artificial light sources such as lamp and natural illumination of interior from daylight. Indoor lighting like wall and roof lighting is a form of fixture and a key part of interior design [12].

LEDs are actually semiconductor-based devices, and for this reason they are expected to have an intrinsically high reliability compared with conventional light sources such as incandescent and fluorescent lamps [26]. The incandescent lamps have a typical lifetime of 1000 h [26], and during ageing can show 10–15% lumen [26] depreciation due to the condensation of the tungsten contained in the filament on the inner part of the glass bulb. While, the fluorescent lamps can reach a 10 000 h [26] lifetime, with a limited (10–20%) lumen [26] decrease, which is due to the degradation of the phosphors used for white light generation, and to the increase in

absorption within the lamp. On the other hand, LEDs can have a significantly longer theoretical lifetime in excess of 50 000 h [26], that contribute to a good candidates for the realization of long-lasting light sources.

The longevity and efficiency of LED lighting delivers significant benefits for indoor applications, especially those currently using incandescent bulbs. Current-generation LEDs deliver approximately five times [13] the efficiency of many incandescent bulbs, and effective light fixture design can improve these gains even further. Since LEDs generate less heat than most light sources, and since the heat generated is not radiated into the work or living space as it is with light bulbs, LEDs can also reduce the load on air conditioning systems and hence reduce the electricity used to cool the area.

1.2 Problem Statement

Normally, LED's lighting will involved a set of LEDs for example 20 LEDs. There is a need to estimate the resultant illumination distribution of a large number of LEDs. By assuming and knowing the distribution pattern from an LED of similar nature, a model to estimate the overall pattern would assist in predicting the output pattern for any desired number of LEDs. This model would be useful in the design of light fixture.

1.3 Objectives

The purposes of this project are:

a) To design, construct and test LED lamps for wall lighting.
b) To measure the distribution of illuminance for a set of LEDs for reading purpose
c) To develop trigonometric model for comparison with the measured distribution.

1.4 Scope of study

The trigonometric method used to be developed a simple model from the output pattern of a single LED. All the LED is assumed have similar output pattern. The study will be limited to illumination for 100cm^2 areas which is for reading purpose. In this study, the number of LED used is below15 LEDs. The positions of LEDs result in a small difference in angular position, in accordance to the assumption made in the model.