

## **Dedication**

For my parents for their kindness  
To my brother (Almotaz Zaki Eissa)  
To my brothers, sisters, friends and  
colleagues  
For their encouragement and support

## And to everyone who had helped me, in this work. **Acknowledgement**

This project has provided me the avenue to appreciate how laboratory testing has an important role in diagnostic diseases and how healthcare professionals can benefit in delivering their diagnosis and treatment plans.

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## List of Abbreviations

ADC	Analog to digital converter
ALT	Alanine Aminotransferase
ALU	Arithmetic logic unit
AST	Aspartate Aminotransferase
AVR	Advanced virtual RISC(Reduced Instruction Set Computer)
BJT	Bipolar junction transistor
CISC	Complex instruction set computer
COM	Component object model (Microsoft)
EEPROM	Electrically erasable programmable read only memory
DP	Dynamic positioning switch
GGT	Gamma Glutamyl Transferase
GND	Ground
HbA <sub>1</sub> C	Glucose syleted Hb1
IC	Integrated circuit
IR	Infrared
ISO	International standard organization
ISE	Ion selective electrode
LASER	Light amplification by stimulated emission of radiation

LCD	Liquid crystal display
LDR	Light independent resistor
LED	Light emitting diode
MCU	Microcontroller unit
MOSFET	Metal Oxide Semiconductor Field effect Transistor
NMOS	N channel Metal Oxide Semiconductor
P-VALUE	Proportional value
PC	Personal Computer
PN-JUNCTION	Positive Negative junction
RS	Start Receiving
RS-232	Receiver and Sending serial port
RW	Read Write PIN
SNR	Signal Noise Ratio
SPD	Self- Scanning Photodiode array
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
USART	Universal Synchronous Asynchronous Receiver
	Transition
USB	Universal Serial Bus
UV	Ultra Violet

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# **Abstract**

A spectrophotometer is an instrument that measures the quantitative amounts of light of different wavelengths which are absorbed and transmitted by a pigment solution.

The transmission spectrometer which was designed in this thesis uses monochromatic light sources that consist of five different colors LEDs (UV, red, yellow, green, and blue). The detected signal was filtered, amplified and interfaced to PC after converted it to digital by using microcontroller Atmega32.

Atmega32 was programmed by using Basic language to control LEDs and measure the voltage drop across the photodiode, this data was sending over RS-232 to the PC.

The spectrophotometer circuit was tested using two types of stander tests (pathological and normal) at temperature  $37C^0$ ; these tests developed by Bio-System Company and passed the tests of ISO.

At wavelength 340nm (UV filter) in pathological test the P-value which was obtained is 0.441with percentage 99.2 and at normal test P-value was 0.444 with percentage 99.8%. . As well as in urea pathological test Blue filter (405nm) P-value was 0.806 with 97.9% percentage and at normal test P-value was 0.374 with percentage 96.2%.

## المستخلص

المطيف الضوئي عبارة عن جهاز يقيس درجة امتصاص او انعكاس المحاليل الصبغية للاطوال الموجية المختلفة التي تمتصُ و تُرسلُ عبر مادة صبغية.

المطيف الضوئي الموصوف في هذا البحث يستخدم خمسة مصادر ضوئية تتميز باحادية اللون وهى عبارة عن (ثنائيات ضوئية باعثة) ذات اطوال موجية مختلفة، الا وهى الثنائى الضوئى الباعث للاشعة فوق البنفسجيه , الثنائى الضوئى الباعث للون الاحمر , الثنائى الضوئى الباعث للون الاصفر , الثنائى الضوئى الباعث للون الاخضر و الثنائى الضوئى الباعث للون الازرق. الاشارة التى تم الكشف عليها يتم ترشيحها وتكبيرها ومن ثم توصيلها للحاسب وذلك بعد تحويلها الى اشارة رقمية يتم الكشف باستخدام microcontroller Atmega32.

تمت برمجة Atmega32 باستخدام لغة Basic وذلك للتحكم في LEDs و يقيس الفقد فى الجهد الناتج فى المتحسس الضوئى ويتم ارسال هذه المعلومات عبر وصلة RS-232 للحاسب الالى.

تم استخدام نوعين من عينات الاختبارات المثالية لاختبار المحاليل القياسيه (المحاليل التى تمثل عينه طبيعيه والاخرى تمثل عينه مريضه) فى درجة حراره 37 م<sup>0</sup>; هذه الاختبارات تم تطويرها بواسطة شركة Bio-System وتم اجازت هذه الاختبارات بواسطة ISO.

عند استخدام مرشح الاشعة فوق البنفسجية (340nm) للعينات المريضه كانت قيمه التناسب هى (0.441) وباستخدام النسبة المئوية تعادل 99.2%. أما فى حالة الاختبارات الطبيعیه كانت قيمة التناسب (0.444) والتي تقدر باستخدام النسبه المئويه 99.8%. وعند اختبار عينه فى المرشح الازرق (405nm) مريضه كانت قيمة التناسب (0.806) مقدرة بالنسبة المئوية بـ 97.9% اما عند استخدام الاختبارات الطبيعیه كانت قيمة التناسب (0.374) مقدرة بنسبة 96.2%.