OPTICAL FIBRE MEASURING INSTRUMENT :

PCB DEVELOPMENT

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BADRULHISAM BIN HJ. MD. SHAH

Faculty of Electrical Engineering

MARA Institute of Technology

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ABSTRACT

The aim of this project is to develop a printed circuit board (PCB), for an optical fibre measuring instrument that can be used in conjunction with an optical fibre sensor. The instrument employed opto-electronics devices such as light emitting diode as a light source and semiconductor photodiode as a photodetector. A fibre optic cable is used as a media of transmission between light source, sensors and photodetector. A photodetector converts the light signals to an electrical signals.

A circuit is designed on a copper embedded board to measure and manipulate the signals from the sensor to an equivalent amount of voltages.This instrument has been designed to detect colour variations and micrometer displacements. The measuring instrument has external power supplies that are 0V, +5V, +12V, -12V and GND. The 0V lines are tied to the GND line. The electronics circuitry development and modifications is based on the printed circuit board of previous works carried out in the same laboratory. The final outputs from this instrument are in the form of voltage levels representing the color variation or micrometer displacement detected through the same fibre optic sensor.

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CHAPTER 1

1.0 INTRODUCTION

New revolution is emerging in fibre optic technology to combine the product outgrowths of fibre optic with the opto-electronics devices to create fibre optic sensors and their measuring system. Fibre optic sensor allows a successful application that is often crucial when the sensor needs to be placed near the high voltage environment or inflammable area. The light weight and small size also allow the device to be used in aerospace and biomedicine applications. Fibre circuit gives advantage to environmental measurand in which the light never leaves the fibre giving high stability as well as sensitivity, power efficiency and provides electromagnetic interference (EMI) immunity.

1.1 OPTICAL FIBRE

Descartes' Laws states that light is a traveling wave that propagates in transparent media. When a light beam S arrives at the separation surface of two transparent media, we simultaneously obtain a reflected beam R1 and transmitted (refracted) beam R2. Figure 1.1 shows that the angle of reflection i1' is equal to the angle of incidence i1 [4].