CHAPTER ONE

1.1 Background

The rapid increase in mobile device usage has heightened the demand for reliable and portable charging solutions, especially in regions with limited access to electricity. Frequent power outages and lack of sustainable energy sources pose significant challenges in maintaining device functionality
[1]. Solar energy, being abundant and renewable, offers a viable solution to these challenges. This project aims to design and develop a solar-powered mobile charger that is compact, efficient, and environmentally friendly, leveraging electrical engineering principles to provide a sustainable power source.

1.2 Aim

The primary aim of this project is to design and implement a solar-powered mobile charger capable of harnessing solar energy to charge mobile devices effectively, providing a sustainable and portable energy solution.

1.3 Objective

- To design a compact and portable charging system using a 6V solar panel.
- To integrate a rechargeable battery (20000 – 30000mAh) for energy storage.
- To implement a TP4056 module for battery protection.
- To regulate output voltage to a stable 5V using LM7805 or buck converter.

- To test the charger's performance under varying sunlight conditions.

1.4 Problem Statement

The growing reliance on smartphones and portable devices is hindered by limited access to reliable electricity, particularly in remote and developing regions. Power outages and the absence of portable charging solutions exacerbate this issue. This project addresses the need for an affordable, portable, and sustainable charging solution through the development of a solar-powered mobile charger.

1.5 Scope of the Work

This project focuses on:

- Designing a charger using a 6V, 5W solar panel and a 3.7V, 20003000mAh lithium-ion battery.
- Incorporate key components including a solar panel, TP4056, rechargeable battery, and voltage regulator.
- Limit to a single USB charging port delivering 5V.
- Testing will be done under typical daylight conditions without MPPT optimization.
- Excludes integration with AC grid or advanced displays.