CHAPTER I
INTRODUCTION

1.1. Background

Bridge is a structure that forms part of a highway that covers a gap. Bridges are also part of land transportation infrastructure that is very vital in the flow of travel (traffic flows). Bridges are often a critical component of a road, because they determine the maximum load of vehicles passing through the road. Bridges carry a road or railway across a natural or artificial obstacle such as a river, canal or another railway or another road. Bridge is a structure corresponding to the heaviest responsibility in carrying a free transport flows of transport and is the most significant component of a transportation system in case of communication over spacings/gaps for whatever reason such as aquatic obstacles, valleys, etc [1].

History of the bridge construction

In the beginning bridges were very simple construction that were built from easily available in natural resources- wooden logs, stone and soil as shown in Figure 1.1. Because of that, they had ability only to span very close distances, and their structural integrity was not high because mortar was not yet invented and rain slowly but constantly dissolved dirt fillings of the bridge. Revolution in the bridge construction came in Ancient Rome whose engineers found that grinded out volcanic rocks can serve as an excellent material for making mortar. This invention enabled them to build much more sturdier, powerful and larger structures than any civilization before them. Seeing the power of roads and connections to distant lands, Roman architects soon spread across the Europe, Africa and Asia, building bridges and roads of very high quality [2].

Develope in materials technology and the structure of civil engineering, bridge construction has progressed in terms of the length of the landscape and the art of

architecture. Today many bridges are long and modern architecture like arch bridges, both from concrete and steel construction as shown in Figure 1.2 and 1.3

Concrete Deck arch bridge , this type of bridge comprises an arch where the deck is completely above the arch. The area between the arch and the deck is known as the spandrel. If the spandrel is solid, usually the case in a concrete or stone arch bridge, the bridge is called a closed-spandrel deck arch bridge. If the deck is supported by a number of vertical columns rising from the arch, the bridge is known as an open-spandrel deck arch bridge [3].

Steel Deck Arch Bridge, An arch bridge is a bridge with abutments (supports at each end of the bridge superstructure) that are shaped as a curved arch. Arch bridges work by transferring the weight of the bridge and its loads partially into a horizontal thrust restrained by the abutments at either side. In the case of a deck arch, the deck, or roadway, rests on top of the supporting arches, which in turn are supported by the abutments and piers in the water . For a steel deck arch bridge, the arches and spandrels are made of steel. The abutments, piers and deck are usually made of concrete [4].

Figure 1. 1 Simple Bridge Construction (Source:[3])

Figure 1. 2 Concrete Deck Arch Bridge (Source:[3])

Figure 1. 3 Steel Deck Arch Bridge (Source:[3])

There are also types of bridges namely suspension bridges, and cable stayed bridges as shown in Figure 1.4 and 1.5

Suspension Bridges typically consist of two (and sometimes four) parallel cables separated by a distance approximately equal to the roadway deck width that they support. These cables act as tension elements and extend from anchors at each of

their ends over the tops of the intermediate towers. The deck is suspended by strong ropes running from the deck level to the main cables. The main cables can consist of parallel strong wires that are aerially spun in place or prefabricated wire ropes. The deck can be stiffened by a truss or by girder elements. The purpose of the stiffening element is to ensure aerodynamic stability and to limit the local angle changes in the deck [4].

Cable Stayed Bridge is a bridge similar to suspended bridge in that it has towers and a deck that is held by cables, but its cables hold the deck by connecting it directly to the towers instead via suspender cables. It usually carries pedestrians, bicycles, automobiles, trucks, and light rail. It is used in places where spans need to be longer than cantilever bridge can achieve (because of its weight), but the span is short enough so a suspension bridge is not practical there economically [4].

Figure 1. 4 Suspension Bridge (Source:[3])

Figure 1. 5 Cable Stayed Bridge (Source:[3])

1.2 Objective of the Study

The objective of the study of this final assignment is design of concrete deck arch bridge.

1.3 Problem Limitation

To design concrete deck arch bridges, some limitation are taken as follows :

1. Only upper structure will be designed
2. The loading bridge using loading regulation of (code RSNI T-02-2005) [5].

1.4 Scope of the Study

The scope of this research begins with finding information and literature reviews relating to the calculation and design of arch deck bridges.the design of arch bridge will be based on standard bridge construction data and calculation will be give in chapter 4,while the result will be given and discussed in chapter 5. In addition,design drawings will be given in the appendix.