THR FLOATING BRIDGE

Rahma Elsayed Rowyda Abd el-mageed Habiba Emad Thoria Masood Rodina Abd Elbaset

Key Words: congestion – durability – exploited-utilization
Group ID : 18117

Abstract

Egypt grand challenges threatens the development of its future. In this semester, two grand challenges are worked on which are urban congestion and population growth . In the last years, Egypt population increased and still in continuous increasing. Those problems have negative effects on Egypt progress as it leads to drivers allocating more time to travel (just in case) and less time on productive activities and also the population growth affect the public health of the people. Innovative solution was developed to solve those challenges and achieve all the design requirements .Therefore, it is focused on using a new building materials which are low in cost as we used the available materials with high quality , high durability as capable for bearing large loads. The project is developed to be with creative shape and design, the bridge is chosen to have a design that is wide enough to increase the surface area and the percent of sinking so tiny . After the testing The prototype met all the design requirements as it carries about 5926.26 kilogram so it will help in solving the challenge .

Introduction

Can you imagine how Egypt will be in the coming years?
The fertility of the Nile allowed the ancient Egyptians to build a great agricultural civilization. Now, Egypt faces many. problems and social media doesn't stop talking about them some of these problems are urban congestion and population growth. These two problems affect Egypt negatively .in last years Egypt population increased to reach to 101,262,242 of people as shown in figure(1) urban congestion effect on quality of life, economy ,and the time that was wasting during standing in the traffic. The biggest affect that is lowering air quality.
Egypt is one of among 8 top countries in population growth.

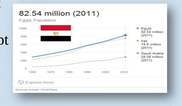
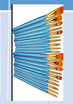


Figure (1) show the density of population in Egypt

The population in Egypt is concentrated in the urban areas, causing pollution (air, water and noise), exhausting the natural resources like water, fuel, etc…., spreading diseases, decrease of health care, increase of death rates, etc. and here's a map that shows the distribution of people in Egypt. Many people tried to solve these problems as they built Al Nasr floating bridge , Evergreen point floating bridge and Dubai floating bridge
And the most effective one is Al Nasr floating bridge as it has many advantages as the bridge saves time because traffic on the bridge does not exceed two and half minutes, the opening and closing time of the bridge does not exceed 4 minutes although it has disadvantages like it is neglected in terms of appearance and there is no development
In order to meet with the design requirements, The solution doesn't use any imported materials (except for the membrane and its inexpensive), and the wind mill that's connected to the pump will be made from available materials in Egypt (so it'll be cheap. The solution is integrated with the surrounding medium). the solution is ecofriendly, it has no harmful emissions or wastes on the environment. The bridge will solve the problem for many generations as (urban congestion) so our solution is efficient.

Materials

Name	Sticks	White glue	Amir glue	Varnish	Siliar	Painting Colors	brushes	string
photo								

The bridge costs 210 L.E

Methods

After many times to determine the shape of the capstone prototype we selected that the prototype will have base and the base will have bind that makes it straight and not fixed ,then it is made with space inside it to make it more suitable to float in water and in the first try we find that the bridge has the shape of arc after many trying to make It become straight again ,after making anthor structure to make it stable and can carry the loads and mass so if this way has been tried it become well and stiff.

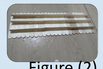
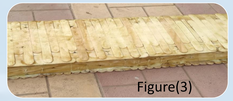


Figure (2)

The way of constructing:-

- the sticks were linked together with the glue
- then it is formed as a base as shown in figure (2)and the layer that is used for traffic (each structure is empty inside it to have more volume and can float and carry more masses).
- the two layers has been linked with each other by white glue then we let them to dry, then it is covered with siliar then it take time to dry
- The layers have been covered with varnish (to have more resistance to water) as shown in figure (3) After that ,acicular pontoons has been used as it make the bridge float and decrease the percent of sinking as shown in figure (4)
- Then the layers were painted with colorful painting .(the shape of pontoons have acicular shape) this how to make the base ,
- Then the pontoons were made with a circular shape with holder to increase the ability of floating


Figure(3)

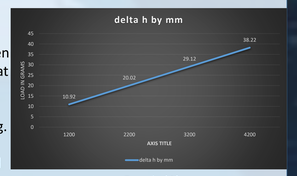
The test plan:-
We will test the design requirements that we use in our prototype and the steps that we followed for every test.
1-the prototype dimensions:-
With measuring the length, width and thickness that we got from doing scaling factor and be sure that dimensions of the prototype is true
2-the vertical displacement:- we will calculate the depth before putting any masses (D) then we will put the masses on the bridge and calculate the depth again(2D) we will calculate the vertical displacement it should be 40 mm (4cm)
3-measuring the masses on the prototype when the vertical displacement reaches 40 [mm]
4-testing the scaling factor that we do to get the values of width and thickness [height] and testing its accuracy to get the true values
5 accuracy of the results:-the results that we get of the prototype has very small error
6- low cost: our prototype coast is 225 L.M .


Figure(4)

Results

To evaluate any project, it must have specific points that the work will be judged by testing them. These points are called the design requirement. They should be experimented to know how the work is being successful. After conducting several tests to insure that the bridge met the design requirements it was found that the bridge achieve specific results as follows:

Test (1):This design requirements have been met as the length is 70 cm comparing with the needed length (50cm : 75cm).
Test 2: as illustrated in graph (1) the relation between the vertical displacement (delta H) and the loads that put on the bridge. Several tests were done to carry out the identified load when the vertical displacement was 40mm. Finally the load was 6000g.
Test 3: - the scale factor was tested to make comparison between the prototype dimensions and the real version bridge as it was 1/44.
more clearly the length of the bridge =339 m and the length of the prototype is 70cm .



Graph (1)

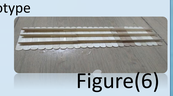
Analysis

Although Egypt has green areas and a lot of water sources, the exploited area in Egypt is 7.8 % in addition to, increasing population in Egypt leads to urban congestion and population growth which are two of the Egypt grand challenges and they are the addressed problem for this semester.
During searching , the project provides utilization of the water areas as a way for transportation not only as water source ,also the project will save time however, concrete bridges cost much money and serving only a fixed percentage of habitants, but the unserved Habitants face daily risks of crossing waterways .
There is a necessity to develop a cost-effective floating bridge that can meet these needs.
After selecting Al Nasr floating bridge to be modified as a prototype

the design of constructing the prototype:-

- It will empty inside to have less weight to be
- harder

to sink in water as learned in chemistry:
when the volume increase the density decrease then the ability to sink is small. (density =mass/volume)
During calculating the dimensions ,mass or density the significant figures should be used . so it can increase the surface area of
the bridge by increasing the width causing increasing in1
the volume (decreasing in the density according to the
Archimedes principles of flotation) then increasing in
its resistance to sink and can carry more load .as shown in figure (6)


Figure(6)

- The length is 70 cm that represents length of the 360 m of the bridge in real and width of 20 cm that represents width of 8.8 m in real and thickness of 5 cm that represents 2.25 m in real and that according to scaling factor of ratio 1:44 to get a design of cuboid of the previous dimensions.
- Increasing of the volume of prototype that is applied in the design by increasing the chamber of air between the base and the upper layer in addition to presence of holder on the sticks on each row of sticks in the base that extend to the upper layer with length reach4.6 cm that is used to fix the sticks of the base and prevent it from having the shape of arc , the sticks was fixed by glue and the whole bridge is covered by a layer of varnish.
- The pontoons are designed as a cylinder with base radius of 5 cm , it increases the ability of bridge to carry more weighs as shown in figure (7)


Figure (7)

Negative results :-
The first design depended on presence of three layers without any pontoons in the after testing the results showed that the design carried 4 kg and sank 5 cm

this prototype met the design requirements as:

- ✓ Bridge dimensions: Span (not touching "land") range = 50 to 75 cm : as the prototype has length of 70 cm without touching the water.
- ✓ the bridge covered by the waterproof that is (siliar and varnish) this two materials able to prevent the water from entering the bridge to not absorb water .
- ✓ - the project shouldn't exceed Vertical displacement (h) of 40mm(4cm) Delta (height) of project during the test plane after putting masses equal to 4.700 kg ,it reach to 5.6 cm
- ✓ The prototype is testable as it can carry load in the center of math according to the law of the center mass as learned in physics $\frac{m1x1+m2x2}{m1+m2}$ the masses has been put in the center . the bridge could carry about 4.700gm balanced and still floats in water when 4 cm of the bridge were immersed (the required vertical displacement) so the project is testable

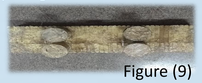


Figure (9)

- ✓ the prototype has the scaling factor of 1:44 so all materials was minimized and work with positive effect .

Then there is a picture of the bridge by sketch up as shown in figure (9)


Figure (9)

Conclusion

urban congestion and its bad consequences encounters vexatious challenge for the Egyptian generations as it slows the development and shorten the road to prosper. So, solutions should be developed to solve this vexatious problem. In the accordance with this, a floating bridge prototype is constructed and according to the test plan, the results have positive effect as the bridge could carry a lot of masses (5 kilo gram) and after putting masses the vertical displacement(delta h)reach to (4.3)cm and still float for good time interval because the bridge itself has small mass equals (1700 gram)
Also the project is economical, eco-friendship ,workable ,safety and Affordable.
the prototype of THR floating bridge has been done to solve the problem of urban congestion and population growth. so the project is successful because it met the design requirements , have many advantages and could solve 2 of the most dangerous problems of Egypt grand challenges so Egypt will established magnificent ,healthy countries race and be one from the developed countries in the world.

Recommendation

WHAT WE RECOMMEND FOR THE FUTUR WORK IN FLOATING BRIDGE?
*Think in a creative way and according to the EDP (Engineering Design Process) steps
*learn about the solutions of urban congestion and how people deal with it
*learn about the factors that required to build any bridge
*learn how to prevent the water from reaching to the bridge
*And finally how to make the bridge straight and doesn't take the shape of arrow
If anyone need to start from the point that we stopped at?
*search about different kinds of water proof and the technique of how to build straight bridge
*study the scaling factor and how to do it for any area

Literature cited

- N.d. RAND Corporation Provides Objective Research Services and Public Policy Analysis. (2001). Retrieved October 4, 2019, from http://www.rand.org/.
- Home. (n.d.). Retrieved October 20, 2019, from http://www.ccsenet.org/.
- (n.d.). Retrieved October 19, 2019, from https://study.com/academy/lesson/what-is-a-scale-factor-definition-formula-examples.html.
- Urban Congestion Impacts and Improvements. (2017, October 25). Retrieved October 25, 2019, from https://miovision.com/blog/urban-congestion-impacts-and-improvements/.

Acknowledgement

THANKS FOR EVERYONE WHO HELPED US:-

*Mr. Ahmed Omara	(school principal)
*Mr. maged fakery	(school deputy)
*Mr. Rami said	(our capstone teacher)
*Mr. Ahmed Ghalwash	(General Capstone leader)
*Mr. Medhat slime	(capstone leader)
*Mr. sayed Rashawn	(fab lab teacher)
*Ms. Hosna malek	(teacher for social work)
*Ms. Manal shawkey	(computer science teacher)

For further information

Rahma.1819121@stemksheikh.moe.edu.eg
Thouraya.1819117@stemksheikh.moe.edu.eg
Rowayda.1819128@stemksheikh.moe.edu.eg
Rodinah.1819123@stemksheikh.moe.edu.eg
Habiba.1819119@stemksheikh.moe.edu.eg