GROUP NO 22103

Martyr Mohammed Hassam floating bridge

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Chapter 1

portfolio

Introduction

Through our faith in the soul of our Teamwork and working together as a one hand.

We are happy to introduce our portfolio to you. This portfolio represents our work and achievements and the result of the integration between learning outcomes in our study throughout our first year in STEM schools. It's a pleasure to present you our ideas in our portfolio, hoping that it will help our country to solve its problems and challenges. As we know, Egypt faces challenges and through our work we will try to solve some of these problems like: reduce the urban congestion and its consequences and overpopulation and its consequences.

So, we will do our best to solve the problem and we will make a new and creative design that satisfies our needs. We hope that you will like our work.

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I. Present and Justify a Problem and Solution Requirements

Egypt Grand Challenges

- **Improve the use of alternative energies**
- **Recycle garbage and waste for economic and environmental purposes**
- **Deal with urban congestion and its consequences**
- **Work to eradicate public health issues/disease**
- **Increase the industrial and agricultural bases of Egypt**
- **Address and reduce pollution fouling our air, water and soil**
- **Improve uses of arid areas**
- **Manage and increase the sources of clean water**
- **Deal with population growth and its consequences**
- **Improve the scientific and technological environment for all**
- **Reduce and adapt to the effect of climatic change**

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Urban congestion

- Congestion involves queuing, slower speeds and raised travel times, which impose prices on the economy and generate multiple impacts on urban regions and their inhabitants. Congestion conjointly includes a vary of indirect impacts including the marginal environmental and resource impacts of congestion, impacts on quality of life, stress, safety in addition as impacts on non-vehicular road space users like the users of sidewalks and road frontage properties. Policy-makers ought to make sure that cost-benefit evaluations or alternative policy evaluation methodologies embody Associate in Nursing assessment of those impacts in addition as take under consideration broader concerns like the sort of cities individuals want.

Causes of congestion:

- **Natural causes**
- **Human causes**

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Natural causes:

1- location

2- Climate

3- Sources of water and perfect soil

Figure (1)

1-Location of Egypt:

It located in the north-eastern corner of Africa and south-western Asia, contiguous the Mediterranean Sea, among Libya and the Gaza strip, and the Red sea north of Sudan.

***Geographic coordinates*:**

Latitude of Egypt: 2700 North of the Equator

Longitude of Egypt: 30 00 East of Greenwich

***Area*:**

The total area of Egypt reaches nearly 1.002.000 m^2, however, the populated area reaches 55367 km^2 representing 5.5% of the total area.

2-Climate:

Egypt's climate is affected by many factors, the most important of which are the location, the landscape the general pressure system and the law-pressure areas. They all contributed to separating Egypt into illustrious climatic regions. Egypt Exist in the dry arid region except for the northern region which enjoys a Mediterranean climate. It is hot and dry in summer and moderate in winter with

little rain which mounts on the coast.

Egypt has only two basic seasons: a moderate winter from November to April, and a hot summer from May to October. Temperature middling is between 9&24 in January, and between 21 and 42 in July and August.

3-sources of water and perfect soil:

Water is not available in every place in Egypt so most people of Egypt live on Nile valley; because of presence of Nile river and the agricultural soil.

Rarely we find who live on the underground water in desert and its sand soil.

- **95% of people of Egypt live on Nile valley but Nile valley represents only 5% of Egypt area so water and soil are the most dangerous factor of congestion**

Human causes:

1- **Work odds**
2- **availability Services**
3- **life level**

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1-work odds:

In big cities like (Cairo, Giza and Alex.) There are many work odds for people who live in Egypt so, many people travel to those cities for work chance without thinking in other chances in them cities. Also, the work odds in big cities give people more merit than the other in the country side and other places so it encourages people to migrate to the central cities.

2-availability Service

In big cities, the government is interested in Making all of service available for people who live in big cities more than the people who live in the country side. This difference can be observed between the central cities such as Cairo and the villages in the country side. This difference makes a huge challenge to the people who live in the country side so they take the decision to migrate to the cities which have more availability service in it.

3-life level

In big cities the welfares level is more than the welfares level in the country side because of availability service and work odds. It makes a huge gap between the people who live in cities and the country side and encourage people to improve them live level and migrate to the cities as they will find work odds and more luxury in it.

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The results of urban congestion

A-traffic congestion

1- bad impact in the economy
2-lowing in the rate of invest
B-rise in the rate of propagation of infection disease

A-traffic congestion Is one of the results of the urban congestion. It happens when there isn't an enough number of roads to cover the cities needs and when there is a lot of people live in the same city and use the same roads in the same time such as in Cairo and Alexandria. traffic congestion can make bad impact on the economy. The larger Cairo Metropolitan space (GCMA), with over nineteen million inhabitants, is host to over common fraction of Egypt's population. The GCMA is additionally a very important contributor to the Egyptian economy in terms of GDP and jobs. The population of the GCMA is anticipated to more increase to twenty-four million by 2027, and correspondingly its importance to the economy will increase.

Traffic congestion could be a significant issue within the GCMA with massive and adverse effects on each the standard of life and also the economy. additionally to the time wasted standing still in traffic, time that might be place to additional productive uses, congestion ends up in unneeded fuel consumption, causes extra wear and tear on vehicles, will increase harmful emissions lowering air quality, will increase the prices of transport for business, Associate in Nursingd makes the GCMA an unattractive location for businesses and trade.

In recognition of the seriousness of the matter of holdup, and upon the request of presidency, the planet Bank funded Associate in Nursing investigation into its magnitude, causes, and potential solutions within the GCMA. the target of the study was supposed to conduct a macro-level

investigation of congestion within the GCMA: its magnitude, causes, associated economic prices, and potential solutions.

A-1-egyption economy can be damaged from the urban congestion. The people in the cities need more and more resources of food, clothes and other things and the governorate can't save all of them. because of that the governorate drives to import. So the economy impact in bad way. The industry didn't produce an enough productive to close people needs and the governorate start to pay money to import and close the people needs. Then the economy damaged.

A-2-invest can be affected by traffic congestion. When investor produce new products. He must move it from the factor to the market in the main roads. But when there is a traffic congestion. The roads were busy so he must move it on another road that is taller than the main roads.

B-rise in the rate of propagation of infection disease. Urban congestion makes the density of population very high. because of that public transport be very busy. Busy in public transport cause a lot of problems such as rise in the rate of propagation of infection disease. Tibur closes is one of the infectious diseases which can be pervade in the busy places. There are diseases can pervade in the busy places in addition to Tibur closes such as ebolavirus.

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What happen if we solve this challenge?

1- Appearance of new cities

2- Lack of traffics congestion

3- Exploit many areas in desert

4- Development in work odds

1-Appearance of new cities

By exploiting the new areas by fixing it, new project cities will appear with new ideas, life and community .it will also help to solve urban congestion by increase the area which the people live in. this step will help to solve urban congestion challenge.

2- Lack of traffics congestion

By appearing new cities, the traffics congestion will be rare to be found because of new wide areas that will be made and also by making new bridges it will reduce traffics congestion. This roads and bridges will help to connect the cities and solve traffic congestion by save more are to cars, vehicles and trucks to move in. the government already start to construction of new roads and bridges.

3-Exploit many areas in desert

By reclamation many areas in desert that gives chance for people to live in desert and planting it so also many cities will appear. The government do it by many ways. The most important way that the government use to do it is saving the main factors such as the sources of water and the other needed factors. The government start to plant the desert areas to attract people to live in this city.

4-Development in work odds

By appearance of new cities there are many chances which will help many people to improve them life level so development in work odds will improve the Egyptian economy too. The government encourage youth people to start to make their startups this step will help the government to let a space to other youth people to work in the governmental works and the startups and it will help to improve the life level for the people.

What happen if we couldn't solve this challenge?

1- Lack of resources

2- Big losing in Egyptian economy

3- Appearing more and more slums

1-Lack of resources

Because 95% of people live on Nile Valley The resources of that area by time will be disappeared so it will cause a hanger. There are many another sources of water in the west desert that the people live around it but it is forming a small percent of the total water resources.

2-Big losing in Egyptian economy

If the hanger happened, our country's economy will face a big losing for much buying more and more resources. This challenge motivates the government to dominant more and more. Because of that the Egyptian industry has been damaged following Egypt will have Big losing in Egyptian economy

3-Appearing more and more slums

In our time slums are rare to be found so we will face it again with more and more slums if there is much congestion. The people who migrate to the cities tries to find cheaper house so they try to build slums which make a huge challenge. When this problem is been solving, the government will build more cities which will solve the slums problem and Appearing more and more slums

Over population

Definition: -

It's one of the grand challenges which is face Egypt. it happens when there are more people than can't live on an area in comfort, happiness and health and still live in Egypt a fit place to the future. It also happens when the rate of population is increase.

Causes of population

1- **Poverty**
2- **Child labor**
3- **Early marriage for girls**
4- **Immigration**
5- **Reduced mortality rates and rising in child rate**

Figure (2)

1-Poverty

In Japan after the second world war, there was poverty everywhere but they faced it by perfect solution; one of them is perfect learning for children.

But now Japan is more than 100 million people but they solved this by less the begets in it, scientists expect that in 2050 Japan will be 800 thousand persons only.

In Egypt, the way is different people of the upper Egypt immigrate to big cities like as (Cairo, Giza and Alex.) so government tried to abounds the perfect services for them to not encourage them to immigrate to those cities as in upper Egypt the work odds aren't more available.

2-Child labor:

In many places of Egypt there're Many people who suffer from poverty so they fall back on begets a lot of Childs to help them by work in an early age and that giving rise to over population so the government try to improve economy in general and improve the economic situation for this people to help to solve this problem. UNICEF estimates that approximately 150 million children under 15 years old are working specially in African countries.

3- Early marriage for girls

In the country side there're a lot of girls who marriage in a young age from what I have to say increase in the number of births specially in upper Egypt and the government try to solve this challenge by care about education specially girls' education and alert people to this problem.
Now Egypt encourages girls' education to reduce this problem by making schools and libraries.

4- Immigration:

One of the worst problems that Egypt faced is the immigration from villages or small cities to big cities for work or education but now the Egyptian government tries to solve this problem by abounding chances of work or education and it encourages for living in those small cities to improvement life level in them.

5-Reduced mortality rates and rising in child rate

By improvement the medical technology has reduced by a high way, in the other way the number of children is increasing by the time but now Egypt awareness her people by beget only 2 children. This way is an effective way to face the overpopulation problem.

The results of over population

1-slums
2-lack of water

1-slums

Over population is a big cause of slums as in a big city there aren't area to adequate all of people so they resort to build slums in down town with a horrid service so it's effects on economy and it was a terrible place for pollution and disease and there aren't any organization in it. When the people who immigrate to the big cities, they try to found a place to live in which is cheaper than the other places so they tend to build slums in the tips of the city.

2-lack of water

Water is the important factor of our life (drop of water is equal a life) so the capacity of water will decrease by time because of the pressure of population on it. when there are more population than the ordinary rate. Every citizen will get water less than he need and be under the water's poverty line

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What happen if we could solve it?

1- saving the environment
2-we ’ll not need to find new resources every year
3- improving the level of health care for children

1- saving the environment

over population influence the environment. for example, we cut down trees to get benefit from its area to plant it or build a building on it. Because of that the environment is hurt.
But if we solve this problem, we ’ll save our environment

2-we ’ll not need to find new resources every year

The resources are limited. Because of overpopulation we need to find new resources every year to cover the needs of population. So, if we solve over population challenge, we ’ll save our resources. The government try to solve this challenge by count on sustainable energies but it isn’t enough to solve this challenge.

3- improving the level of health care for children

Every day there are a lot of children that born. The government pay a lot of money to care about their health.
When we lower the number of children who born, we ’ll save a lot of money, and we ’ll use it to improve the health sector.
Therefore, improve the level of health care for children

Problem to be solved

There is a big problem that retard evolution in Egypt, this problem is how to crossing the water ways. This problem is dangerous because it retards trade between cities, countries and any two areas. The government try to solve this problem by a lot of ways such as, traditional ways like traditional bridge or modern ways like floating bridge.

Traditional ways to across water ways in Egypt

People tried to across water ways in different ways in the past. If they get a problem to across the water way, they fill it with soil .in many times they try to across it with a simple bridge made from wood taking from trees or palm. They try to use ferries to across it. The government try to solve this problem by made traditional bridges. There're a lot of traditional bridges in Egypt for example

In the country side there are a lot of canals and water ways.in the past people solve the challenge of cross water ways by many traditional ways the try to cross over ant thing that broken on the water ways such as tree, tube or palm, it causes many accidents because there aren't any safety requirements. In some times this accident upgrade and people die. Now the

Figure (3)

government try to solve this challenge by building a bridge with a safety requirement. And this bridge is already work right no

In the upper Egypt there isn't a lot of bridges to let people to across from the east bank to the west bank. The people solve this problem by ferries. Ferry is a boat which is used to cross people and vehicles from a side of a water way to another side, the challenge in ferry that is it take a lot of time to cross only on pass and it take a limited load on it. When we rise the load on it, it will sink and make a huge problem

Figure (4)

in many places in Egypt there are many old bridges that need to maintenance. This bridge has unfixed poles and need to maintenance. More of this bridge are designed to stand a known load. There are vehicles have a load more than the maximum load so it impacts to the bridge efficiency and make it very weak

Figure (5)

In a big city which has a water way divide it to two sides. We need a huge bridge to move the goods from a side to another one. The government build a lot of traditional bridges to solve this challenge. The problem with this bridges that it costs a lot of money to maintenance, and cost more money to build. There are a lot of examples about traditional bridges such as

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1- “Qasr El Nil Bridge”

2- “Rod El Frag Axis bridge”

1- <u>“Qasr El Nil Bridge”</u>

To deal with this problem the government build this bridge it’s open in 1933 to develop Cairo. it’s across over the Nile. It’s linked the east side of Nile with the island of Zamalek.it one of the most important bridges in the Cairo as it solves a huge part of urban congestion challenge. It was the first bridge which build to cross the Nile in Egypt.

Figure (6)

2- <u>“Rod El frag Axis bridge”</u>

It’s a bridge that links areas in northern and eastern Cairo. It’s length about 16.7kilo meters it’s an amazing Cable-stayed bridge. One more fact is that it’s the widest bridge in the world

Figure (7)

Floating bridge

Definition:

A bridge extension is a crowd of specific, shallow draft vessels or buoys, associated together to cross a stream or channel, with a track or deck joined on top. The water lightness bolsters the vessels, restricting the most extreme burden to the aggregate and point lightness of the barges or boats The supporting pontoons or buoys can be open or shut, impermanent or lasting in establishment, and made of elastic, metal, wood, or cement. The decking might be brief or changeless, and built out of wood, measured metal, or black-top or reinforce over a metal edge.

Advantages:

1-It's easy for transportation.

2-It has a simple structure.

3-It's able to be expanded.

4-it's very saved for environment.

5-it has a design a low effort

6-we can use multiple types of material to build

Disadvantages:

1. **It can be sinking.**
2. **It can be weak in front of strong water waves.**
3. **Its mass center can be weak in front of Freight carts.**

For example:

1-<u>Martyr Ahmed el-Mansy floating bridge:</u>

Figure (8)

Abdel Fatah al-Sisi inaugurated it on Saturday 23 December 2017. It Connects the Eastern and Western shores of the Suez Canal. It is located in Zone 6 in the Ismailia Governorate. It is built to achieve integration with ferries and undersea tunnel. It is importance as it decreases the movement of citizens form the eastern side of the canal to western lands as part of the infrastructure necessary to urban collection Eastern the canal and connecting Sinai with the rest of Egypt That Supports the projects of development that executed in the Suez Canal governorates. The total length of the bridge 622meter. The eastern part equal 372 meters and the western part equal 350 meters. the total width equal 15 meter. The lanes of vehicles is7.7. It's height equal 1.65 meters. The iron plates used to construct the entire bridge are2960 tons. every part of the bridge includes three pantones. Vehicles are allowed to cross both directions simultaneously, and heavy transport vehicles up to 70 tons are allowed to move in one direction. The bridge is open for up to 8 hours.

2- Martyr Abanob Girgis:

Figure (8)

It is at' Kantara, Ismailia in kilo 46,800. Its Length is 350m. It has two anchorages on the sides of the waterway as it allows the passage of vehicles in both directions at the same time. It has 3 pillars to stabilize the floating bridge during passage of ships. It consists of 3 parts, first of it a floating part that is 257m long .it consist of three similar pantones every one of it reaching 85 meters in length, 15 meters in width and highest equal 2.25 meters. and two constant parts that are 93m long. Vehicles are allowed to cross both directions simultaneously, and heavy transport vehicles up to 70 tons are allowed to move in one direction. The bridge is open for up to 10 hours

3-Al Nasr floating bridge:

Figure (9)

It connects between Port Said and Port Fouad. It is Egypt's first floating bridge. It is 421m long. it is built with 2500 tons of steel and expected to save time with vehicles passing from one side to the other in four minutes. It was constructed on a-nine-month period and guaranteed for eight years. It is located in Raswa area and over the Suez Canal

4- Evergreen Point Floating Bridge:

Figure (10)

It is also known as the 520 Bridge, its total length is 7,710 feet (2,350 m), it opened in April 11-25, 2016, it is the longest floating bridge in the world, it consists of traditional fixed spans at each end. At each end, the approach system includes a ramp system that carries the roadway up to a single span high level through truss to allow for medium sized boats.

5-Srabyom Floating Bridge:

Figure (11)

It locates in Ismailia, Egypt in kilometer 90 numbering channel in two parts similar to the martyr Ahmed Mansi bridge.it is open to let the ships to cross in the Suez Canal. It has length which is equal 325 meters. and width which is 15 meters height is equal to 2.25 meters. The maximum load of it is equal to70 tons It built with 100% Egyptian hands. It is built to connect between the two banks of Suez Canal. The government build it as a floating bridge because it can be moved to let the ships to cross.

6-Martyr Ahmed Omar Shabrawy Floating Bridge:

Figure (12)

It is located in the 147.7 km numbering channel with a length of 227 meters, and a surface width of 15 meters, while the contact with water is 25 meters. The bridge allows passenger cars and medium transport in two directions while heavy transport crosses in one direction with a maximum load of 70 tons. It consists of three pontoon floats each 75 meters long. And Is designed according to international standards that ensure the elements of safety and maritime safety

7-Yumemai Floating Bridge:

It comprises a floating bridge over the waterway. Transitional girder bridges on both ends of the floating bridge. And approach bridges on Yumeshima and Maishima. The bridge is supported on two large steel pontoons. Ordinarily, the bridge allows a navigation passage width of 135m in the event that the main waterway is out of service. The bridge is swung by tugboats to widen the passage width to 200m or more, enabling the passage of larger vessels.

Figure (14)

8-hood canal floating bridge:

The Hood Canal Bridge (officially William A. Bugge Bridge) may be a bridge within the northwest u. s., situated in western Washington.[2] It carries State Route 104 across Hood Canal of sound and connects the Olympic and Kitsap Peninsulas. At 7,869 feet (1.490 mi; 2.398 km) long (floating portion half-dozen,521 feet (1.235 mi; 1.988 km)), it's the longest bridge within the world situated in a very H2O basin, and also the third longest bridge overall. initial opened fifty-eight years past in 1961, it absolutely was the second concrete bridge made in Washington. Since that point, it's become an important link for native residents, freight haulers, commuters, and recreational travelers. The convenience it provides has had a significant impact on economic development, particularly in Japanese Thomas Jefferson County.

Figure (15)

9-The Demerara Harbour floating Bridge:

Figure (16)

The Demerara Harbour Bridge could be a six,074-foot (1,851 m) long floating toll bridge. it absolutely was commissioned on a pair of Gregorian calendar month 1978.[1] The bridge crosses the Demerara stream four miles (6.4 km) south of the Guyanese capital Georgetown, from Peter's Hall, East Bank Demerara to Schoon Ord, geographic region Demerara, connecting Demerara-Mahaica (Region 4) with Essequibo Islands-West Demerara (Region 3) on the geographic region. there's a pedestrian foot walk. A raised section lets tiny vessels pass underneath. A surgical instrument span lets giant vessels pass. Construction of the Demerara Harbour Bridge began on twenty-nine could 1976. Construction help was provided by land Government; however, the fundamental style was by a Guyanese, Capt. John St. Patrick Coghlan. The bridge was solely designed to last ten years; however, it's still going sturdy.[1][2] Tolls area unit collected solely in one direction of travel although the bridge handles one lane of traffic in every direction. Traffic going west to east pays no toll.

The bridge is strictly one.25 miles (2.01 km) long and has sixty-one spans. A high-level span provides a horizontal clearance of thirty-two.0 meters (105 ft) and a vertical clearance of seven.9 meters (26 ft) to let tiny craft pass in the slightest degree times. To let giant craft pass, 2 surgical instrument spans retract absolutely to depart a horizontal clearance of seventy-seven.4 meters (254 ft).

10-Homer M., Floating Bridge:

it is one amongst the interstate ninety floating bridges. it's the fifth-longest bridge within the world, at 5,811 feet (1772 m). It carries the west lanes of interstate ninety across Lake Washington between Mercer Island, Washington, and port of entry, Washington. it absolutely was inbuilt 1940 (and renamed in 1967 because the Lacey V. Edward Roscoe Murrow Bridge), it had bother and sank in an exceedingly storm in 1990; the govt attempt to solve this challenge by reconstruction it. it absolutely was remodeled in 1993 to hold eastward lanes of U.S. interstate ninety. The Homer M. Hadley Bridge was erected in 1989 simply to the north of the Edward Roscoe Murrow Bridge and accommodated 2 west-bound lanes, 2 reversible lanes, and a bicycle path.

Figure (17)

11-William R. Bennett Bridge:

The William R. aviator Bridge could be a bateau bridge within the Okanagan vale of Canadian province, Canada. Completed on might twenty five, 2008, the bridge replaced the older Okanagan Lake Bridge constitutional 1958 to link Downtown Kelowna to West Kelowna across Okanagan Lake as a part of route ninety seven.

Figure (18)

On Apr twenty one, 2005, Premier Gordon Campbell formally renamed the bridge from the Okanagan Lake Bridge to William R.

{bennett|Bennett|Floyd aviator|aviator|aeronaut|airman|flier|flyer} Bridge in honor of former Premier William Richards Bennett, a native of Kelowna

Construction budget:

The first release from the BC Ministry of Transportation to incorporate budget data was in 2003. At that point, the project was calculable to price $100 million CAD for the bridge and another $20 million CAD for the 2 interchange upgrades on the side of the lake.[1]

By June 29, 2005, the value of the bridge was exaggerated from the previous estimate of $100 million CAD to $144 million CAD "due to dramatic will increase within the cost of construction materials and labor", which incorporates important will increase within the price of concrete, steel, and fuel. Over consecutive thirty years, the province of Canadian province expects to pay SNC-Lavalin a complete of $179 million CAD "to style, build, finance, operate, maintain and rehabilitate the bridge".[2]

Research:

What we learn from research about the challenges?

After doing a lot of research about the challenge; we learn more and more things about it. First thing which we learn is the main challenges that face our country and the subcarrier challenges which subcarrier problem that subcarrier from it. The second thing which we learn is the prior solution that already tried after we search and get a perfect feedback about it, we try to apply critical thinking on this challenge and develop a solution to solve this challenge. We also learn how to use our thinking to be useful for our country.

What we learn from research about the old solution?

After doing a lot of research about the solution: we learn more and more things about the floating bridges and difference between three designs of floating bridges. We found that floating bridge is divide to three types: the first design is ponton bridge whi1ch slap is above the pontoons, the second design is the bridge which touch the water and the third bridge is the arche bridge. We also learn about the advantages and disadvantages of every design. According to our search we decide which design will we apply and how to develop it.

Chapter 2

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Design requirements:

1. Bridge dimensions: Span (not touching "land") range = 50 to 75 cm, The bridge must span between 50 and 75 cm of water without touching bottom or touching anything other than water.

2. Bridge ends cannot be attached. The bridge ends may lay on the edge of a test container (edges represent land), but may not be attached at the edges of the test container so that the bridge can be moved from test container to test container, and so that the load of the bridge is carried by floatation rather than the ends of the bridge.

3. Vertical displacement (h), It' the vertical length of the immersed part below the water surface. Delta h is the difference between the initial vertical displacement without any load on the bridge and the displacement after loading the bridge with masses.

4. The prototype bridge must be testable. You will measure and record the difference in vertical displacement -Delta h- (mm) as a function of load (kg) which placed on the bridge. Load masses to be put on the center of the bridge should increment by 50 gm (50, 100, 150, 200, 250 ...

5. You must record the mass on the bridge when the difference in the vertical displacement (Delta h) reached 40 mm Expect to show this measured data in a graph on your poster.

6. Calculate scaling factor. Calculate and record the scaling factor of your prototype to the real version of your bridge design.

7. Minimize materials. You will count and record all of the materials you use for your final design, including number of craft sticks and amount of string. You will describe how you tried to minimize the amount of materials you used

Our solution

Yumemai Floating Bridge: -

Location:

It locates in konohana, Osaka, Japan.

Dimensions:

Length:867m

Width:33.8m

Joining:

Approach Yumeshima and Maishima islands.

safety ways:

-The bridge is supported on two large steel pontoons.

. The bridge is swung by tugboats to widen the passage width to 200m or more, enabling the passage of larger vessels.

Opened time:

Construction end at 2001 and took about two years for the opening.

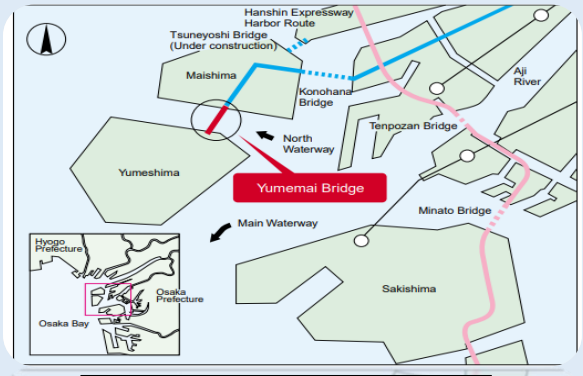

Figure (19)

Figure (20)

Selection of Bridge Type:

the lift bridge, swing bridge, retractable bridge, and bascule bridge are candidates for a movable bridge. These candidates, excluding the bascule

bridge, were compared and investigated for suitability to the Yumemai Bridge, which must provide a relatively wide (200 m) navigation passage in emergency.

Advantages:

The Yumemai Bridge is the world first floating swing bridge. In designing this bridge, therefore, it was necessary not only to meet various existing design standards, such as the "Highway Bridge Specifications," but also to solve many technical problems. The bridge has successfully been installed on the site, thanks to cooperation from the academic sector, and from various industrial fields, including the shipbuilding, machinery and electric industries. The Yumemai Bridge is scheduled to be fully completed by the late fall of 2000.

Design of Pontoons:

pontoons of computer structure would become vast in size, creating it tough for the bridge to permit safe passage of boats. additionally, giant skinny wall computer structures area unit tough to construct. seeable of those aspects, steel pontoons were adopted for this bridge the outmost frame of the pontoon is of double-hull structure comprising outer wall and water-tight inner wall, as a failsafe live against attainable water outpouring within the event of harm to the outer wall. The water-tight inner wall is put in three m within the outer wall. For safety just in case of ship collision, the outmost construction limit was set at half dozen m within from the outer wall. construction supports area unit positioned at intervals this limit. the strain generated at the bottom of every pontoon support is just too advanced to be determined by skeleton analysis solely. Stress flow was thus processed by analyzing the FEM model of the complete pontoon shown.

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The place of bridge

Talkha city

- **Talkha is located on the west bank of Dumyat from The Nile River.**
- **Talkha has three bridges which are Talkha bridge, Mansoura university bridge and the railway bridge.**
- **It's belongs to Dakahlia governorate and it's located west of Mansoura city.**
- **Talkha is a link between Dakahlia and the central delta governorates.**
- **Talkha has a population of approximately = 95292 people.**
- **The total area of approximately $= 288km^2$.**
- **Density population ≈331 person/km^2.**
- **It's industrial activity: fertilizers, electricity, auto parts, coca cola, sanitary ware and clay bricks.**
- **Heading to Talkha from north will find buildings and institutions that are high: delta company for fertilizers and chemical industries, which produce more than 30% of chemical fertilizers nationwide.**

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Al Mansoura city

The total area of Dakahlia governorate is 3459 km2.

The city of Mansoura is located east of the Nile river (Damietta branch), which alone.

Founder of the city of Mansoura is king full Ayyubid nephew of hero Saladin.

Its eastern border is the Mansourieh canal

Approaching the Mediterranean coast to a distance of 60 km on longitude 31 ,32 east and latitude 31.5 north.

The population of the governorate in 2011 (5,551,592 people) by 6.8% of the total population of the republic making it one of the largest governorates of Egypt.

The governorate includes (18) centers and (3) cities.

Its followed by 110 local and village units comprising 336 villages, 2072 manor houses and a small population. The soul.

Density of governorate equal a,604.97.

The population of al Mansoura of 2012 year is 960,423 people.

The total of area is 371000000m2

Figure (21)

portfolio

The density of al Mansoura is 0.001breeze/km

The decision is taken to but this bridge between these two cities because there aren't bridges in the north side of the Nile in this place. This factor makes a huge challenge for the people who live there. The challenge is when the people in the north of the city and they want to across to the other side of the Nile

drawing scale

dimensions of our bridge:

the length of bridge according to the width of Nile river: 200m

the width of bridge: 28m

the distribution of calientes: -

1. **Side walk pedestrian is 4m**
2. **first Lane of traffic is 12m**
3. **second Lane of traffic is 12m**

pontoon scale: -
length: 30m
width:40m
height:15m

dimensions our prototype: -

length:60cm

width:13.5cm

pontoon dimensions: -

length: 13.5cm

width: 25cm

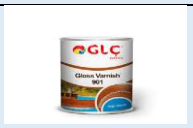
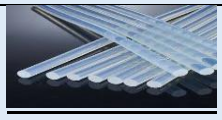
height: 9cm

Chapter 3

portfolio

Materials and Methods:

Materials

No.	Item	Cost	Quantity	Source of purchase	Picture
1-	Sticks	28.5 L.E	285 sticks	Hossam el-din library	
2-	Gloss varnish 901	13.75 L.E	250 gm	Mohamed Aly store	
3-	Superglue Amir alpha	9 L.E	9 tubes	Mohamed Aly store	
4-	Glue gun	-	1 gun	From home	
5-	Glue gun sticks	7.5 L.E	5 glue sticks	Hossam el- din library	

6-	**Scissors**	**-**	**1**	**From home**	
7-	**brush**	**-**	**1**	**From home**	
Total cost of the prototype			**58.75 L.E**		

Methods

First Step (drawing the main parts on sheet of paper): -

After making scale and get the right dimensions, we designed prototype on a piece of paper with the needed dimensions and began to cut sticks on paper. From the design we determined the number of sticks and the dimensions for every stick and on paper we divided our prototype into three main parts: -

1) **Arches**
2) **Deck**
3) **Pontoon**

Second step (cutting sticks forming the parts of prototype): -

First part: Arches:

Figure (22): arches

In our design we made two arches in every side of bridge. The first arch function is holding the deck over the pontoon and it is advantages are preventing water to over the deck. The second arch function is to connect bridge with pontoon and it is advantages are to distribute the pressure all over the bridge. We connected between two arches and bridge by cables made from sticks and connected between arches in two sides with sticks.

Second part: Deck:

Figure (23): The deck

On the paper we made the deck in rectangular shape on the bases with dimensions of cuboid: width= 13.5 cm., length= 60 cm. and height = 1.9cm. It built with two bases has different arrangement shape, as the first was with horizontal arrangement and the second is with vertical arrangement; to strong the deck as the pressure distributes on the two bases.

Third part: pontoon:

The most important part in prototype as many calculations perfume on it as vertical displacement. We chose dimensions of cuboid solid: length: 25cm, width: 13.5cm and height: 9cm we made it by manage sticks in a specific way and connect between them with the glue which we close every space to stop water to get inside it .after that we paint it with water proof

Figure (24): One pontoon

After we had finished constructing the prototype, we made a test plan consists of many stages to see if the modifications that we added will make a change or not in the efficiency, eco-friendly and the availability and low cost of material of the floating bridge.

Figure (25): The prototype

The first stage: we studied design requirements to make good test plan which are:

1) The availability and low cost of material: materials should be available in big .amounts to cost less and be easy to get not to lead to economic problems

2) The Eco-friendly: being of materials and products ecofriendly not to harm the environment and surrounding nature is one of the conditions to reach the .design requirement

3) High efficiency: the products and the results achieve and pass the expected results and the biodiesel will be able to work in different temperatures.

-The tools that we needed in test plan which are: - container, scale, prototype and special ruler.

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Test plan

After we had finished constructing the prototype, we made a test plan consists of many stages to see if the modifications that we added will make a change or not in the efficiency, eco-friendly and the availability and low cost of material of the floating bridge.

The first stage: we studied design requirements to make good test plan which are:

1) The availability and low cost of material: materials should be available in big amounts to cost less and be easy to get not to lead to economic problems .

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3) High efficiency: the products and the results achieve and pass the expected results and the biodiesel will be able to work in different temperatures.

-The tools that we needed in test plan which are: - container, scale, prototype and special ruler.

After that, we do the test plan which steps are: -

1) Testing material by testing: - glue with sticks, waterproof and testing cutting of the sticks.

2) We filled the box with water and but our prototype on the surface of water without tying it.

3) We measured the delta (H) for the part which sank in the water.

4) Then we put a small weight on the prototype and measured delta (H) for the part which sank again. After that, we increased the weight which we put on the prototype and measured the delta (H) for the part and we repeat this proses many times and write down our perception.

5) Finally, we made a ratio (diagram) between all results using statistics in math.

portfolio

-The first test plan: -

It was failed as the mistake was in the dimensions of the pontoons were not equal to each other as, it led the bridge to slope after putting a load on bridge equals 250 gm, so it failed in achieving the design requirements but we corrected it.

The second test plan: -

It was failed as the mistake was after making the right dimensions of pontoons during the test plan there was a hole in a pontoon, so it allowed water to enter it, so the bridge sloped again and lost its equilibrium and made it to sink.

The third test plan (The final one): -

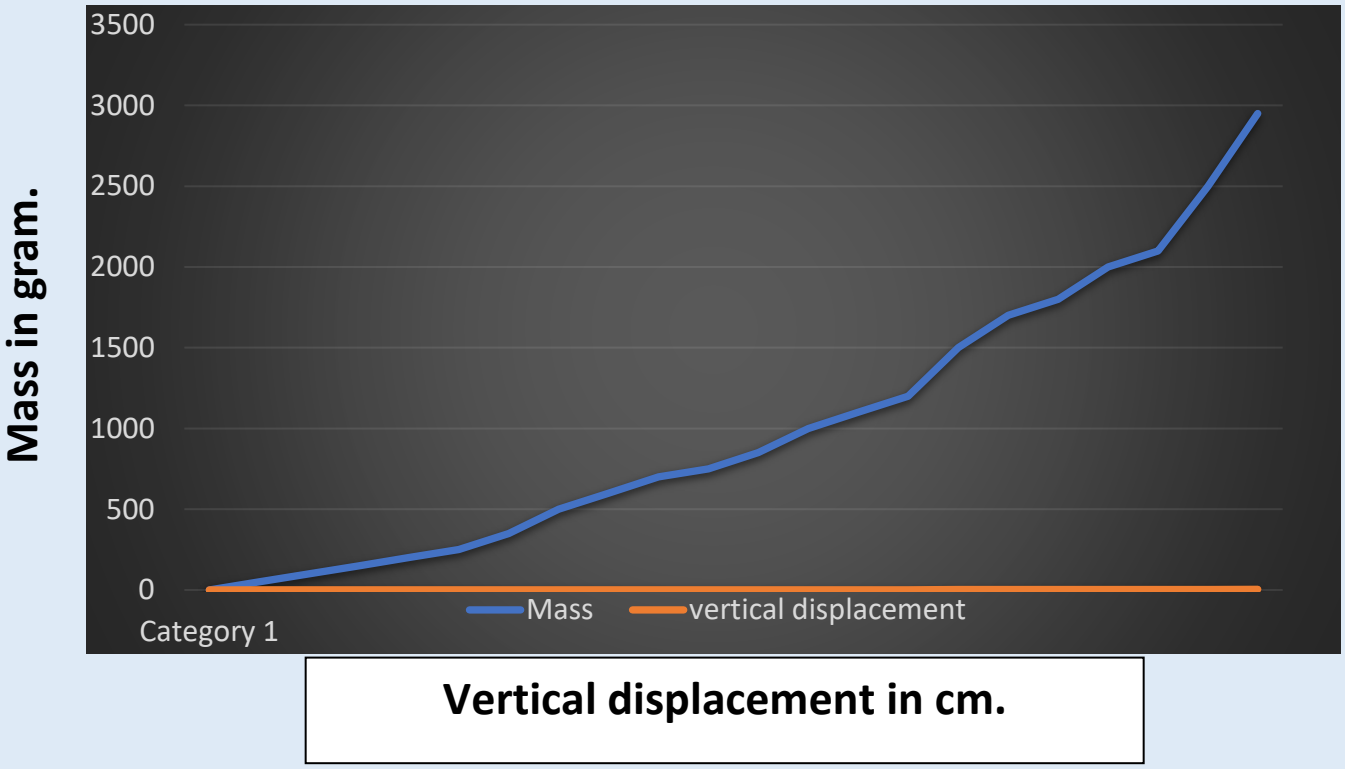
It's success as the needed requirements were achieved after editing in the dimensions of pontoons, as those were high efficiency, safety and low cost. The important in results that the bridge can hold to maximum mass equals 2.95 kg. So, we got the data collection from it.

Data collection

portfolio

After making our prototype, we made 3 test plans and we have results that were satisfying. After we finished testing our prototype, we collected Data for each part.

Firstly, the results were not constant due to the change in the conditions. But later the test plan process became stable and the values became constant. So, we recorded the ranges of the results as shown in graph (8).



Graph (8): represents the vertical displacement until 4cm.

The prototype was made in different ways with many different changes on its pontoons that affects the vertical displacement of the bridge and the maximum

mass fell on its center mass, so we get many results which were positive and negative results.

Negative results:

The first mistake was in the dimensions of the pontoons were not equal to each other as it led the bridge to slope after putting a load on bridge equals 250 gm, so it failed in achieving the design requirements.

The second mistake was after making the right dimensions of pontoons during the test plan there was a hole in a pontoon, so it allowed water to enter it, so the bridge sloped again and sank.

Positive results:

The needed requirements were achieved after editing in the dimensions of pontoons, as those were high efficiency, safety and low cost. The most important result is that the bridge can hold to maximum mass equals 2.95 kg.

Mass in gm	Vertical displacement in cm.
0	0
50	0.3
150	0.4
200	0.4
250	0.5
350	0.7
500	0.8
600	0.9
700	1
750	1.1
850	1.2
1000	1.5
1100	1.7
1200	1.8
1500	2.3
1700	2.4
1800	2.5
2000	2.6
2100	2.8
2500	3.5
2950	4

Table (1): represents the mass and vertical displacement.

Chapter 4

Analysis and Discussion:

The idea of the floating bridge is about solving the crossing waterways with low cost, safety and high efficiency so it will help the government to save more money for the transportation of the citizens into the country with low cost and help also In distributing the population of citizens into new cities, so it helps the government to overpass the urban congestion and overpopulation.

Floating bridges have many advantages than the traditional bridges as they have a straightforward structure, which is able to be expanded, can be transferred from place to another and can be maintained by low effort. The idea of making the floating bridge by the arch design because it is able to distribute the stress falling on it as it works as a supporter for the deck of the bridge and works as a safety. It makes the bridge at low cost by decreasing the number of pontoons to only two pontoons. so, it achieved the solution requirements that are high efficiency, safety and low cost.

Depending on specific gravity that says that the density of water minus the density of the bridge gives us the sank part of the bridge and using the center of mass the load was put on it to give the vertical displacement and using newton's second law which says force equal mass multiply acceleration due to gravity F=M×G as, the Archimedes law of floating that says the force that body applies on water equal

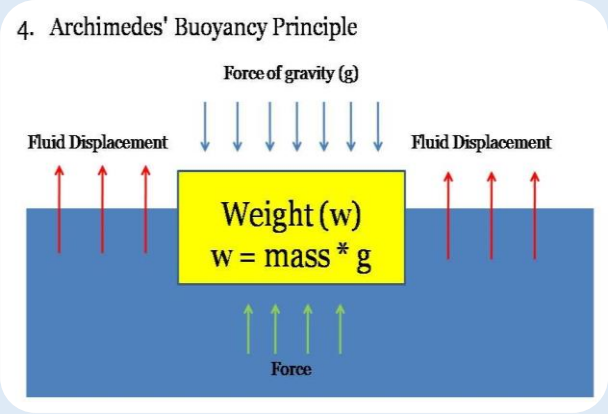


Figure (26): represents the Archimedes law of floating

the weight of water that is displaced so, we get the weight of the mass that is fallen on the bridge and

the vertical displacement of the bridge until it reaches

to 4 cm

The errors of the dimensions of the prototype were equal:

1.The deck: length= (60±0.5) cm and width= (13±0.1) cm

2.The pontoons: length= (13.5±0.15) cm,

width= (25±0.2) cm and height= (9±1) cm.

for every 100 m in the deck, there is 1 m

in the width of the arch, so the arch's width

is 2 m.

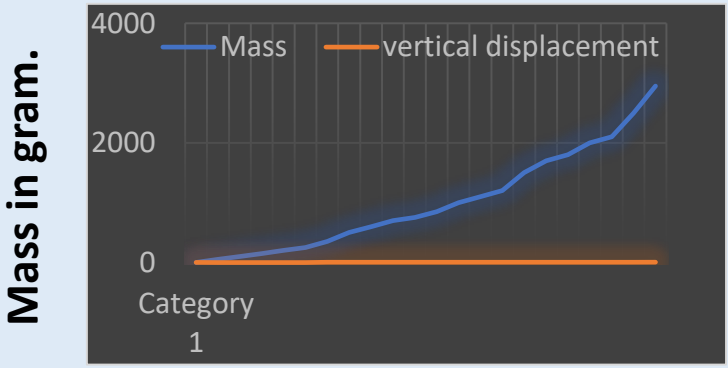
the scaling factor is 0.3, so the Prototype

dimensions are shown in table (3).

after making prototype and testing it, successful results were recorded as shown in graph (3)

dimension	Real dimensions	Dimension with scale	Prototype dimension
Length	200 m	60 cm	60 cm
Width	28 m	8.4 cm	13 cm
Pontoon length	30 m	9 cm	13.5 cm
Pontoon width	50 m	15 cm	25 cm
Pontoon height	9 m	2.7 cm	9 cm

Table (3): represents dimensions and scaling.



Graph (3): represents the vertical displacement until 4cm.

sketch up was software

was used for making 3d model

simulation for the prototype as

shown in figure (7)

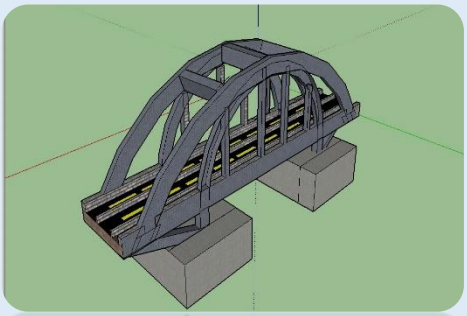


Figure (27): The 3d model of the floating bridge

<u>Real bridge location:</u>

The real bridge is located between Talkha and El Mansoura in

Dakahlia government. There are three bridges in Talkha but all of 022221110

them are located in south of the city, so population living in the

north is forced to cross the river on ferries or drive a long distance

equal to(2km) from north to south to cross the river, so it depletes

Figure (28): represents the place of the real bridge on the Nile river

long time and much fuel. This problem gives a perfect reason to

solve it by that floating bridge

Recommendations:

Nothing is perfect, there will be always missed points and there is no endpoint for any scientific research, so we recommend you:

In prototype:

1- To get a perfect background about floating bridges and research for new designs.

2- To use strong sticks, a suitable and eco-friendly glue with high efficiency and finally use burned rubber as waterproof material.

3- To perform more than one test plan to get more results and information about your simulation.

4- Choose bridge suitable with your scaling.

In real bridge:

1- Search for the most suitable area to build the bridge on it.

2- Ask special engineers about your idea and its advantages and disadvantages.

3- Use strong materials in making the body of the bridge and aqua friendly cement and waterproof.

4- Estimate the time to finish the bridge in the real life.

At the end we wish these pieces of advice help you as they can and we think the project will be less cost, eco-friendly, more efficiency and independent.

Learning Outcomes:

Physics

1/

LO1: - Systems of measurements and standards: - We used it to measure all dimensions of the bridge

2/

LO1: - International system of units: - we used SI units for our measurements.

3/

LO1: - Measurement errors: - there are normally errors in measuring dimensions so we use the rules of errors

4/

LO1: - Measurement accuracy vs. precision: - when we get some values and they all are near from the real value this called accuracy. Also, when we some get values that they are close together but they are far from the real value this is called precision.

5/

LO2: - Forces: - to know what are types of forces act in our bridge, if it is gravitational, friction, normal or tension force. And it is important for the balance of the bridge.

6/

LO5: - Center of mass: - to know during test where we will put the total mass on.

portfolio

CHEMISTRY

7/

LO1: - scientific methods: - these methods are followed on our capstone to solve any problem.

8/

LO1: - Scientific laws: - we used some scientific laws and followed theories in our project.

9/

LO1: - density: - We use it to determine the density of water and prototype to know if it well sinks or float on the water

10/

LO1: - significant figures: -they are important to show the precision of the measure because no measuring device can make a measurement with 100% precision

11/

LO1: - specific gravity: - when we calculate the magnitude of density and divide it over the density of water to know if it will float or sink

12/

LO1: - types of variables: - variable is anything in your experiment that can change. It's a property that can take on many values. from its types (independent, dependent, controlled, Qualitative

Geology: -

13/

portfolio

LO1: - branches of geology: - we know from the branches how does water move and we take care from the direction of water current.

14/

LO3: - crushed stones: - we can decide from its what kinds of stones we will build the bridge on

Math

15/

LO3: - 2&3 Dimensions shapes: - it will us to build perfect prototype by learning about how to get the dimension of things and draw it in apps or paper.

16/

LO1: - six trigonometric function: - we can benefit from it if we want to measure any angle or side

17/

LO1: - ANGLE OF ELEVATION AND DEPRESION: -it benefits us if we want to know the high of the bridge by using these angles and a side like the length of the bridge.

18/

LO2: -histogram: - it helps us to do an organized diagram for our results of the test.

Biology

19/

LO1: -infectious and noninfectious diseases: -it helps us to keep our place we will build the bridge on healthy or unhealthy.

English

20/

portfolio

We learned how to write academic essays which was helpful in writing the poster and the portfolio

Computer science

21/

LO4: - solving problems: -We used the steps in solving any problem in programming as it the EDP steps in capstone.

Social studies

22/

We used what we know about the geography of Egypt to determine the best places where we can build our bridge in.

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