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Bridges and Their Studies

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Abstract:
This paper targets to explain different types of bridges that exists and how they are benefit to countries economy. This paper explains different types of bridges and their applications. It also explains the need of a particular bridge at a particular place.

Introduction:
A bridge is a structure built to span physical obstacles without closing the way underneath such as a body of water, valley, or road, for the purpose of providing passage over the obstacle. There are many different designs that each serve a particular purpose and apply to different situations.

Designs of bridges vary depending on
1. The function of the bridge.
2. The nature of the terrain.
3. Where the bridge is constructed and anchored.
4. The material used to make it, and the funds available to build it.

History:
The first bridges were believed to be made by nature as simple as a log fallen across a stream. The first bridges made by humans were probably spans of wooden logs or planks and eventually stones, using a simple support and crossbeam arrangement. Some early Americans used trees or bamboo poles to cross small caverns or wells to get from one place to another.

A common form of lashing sticks, logs, and deciduous branches together involved the use of long reeds or other harvested fibers woven together to form a huge rope capable of binding and holding together the materials used in early bridges. The greatest bridge builders of antiquity were the ancient Romans. The Romans built arch bridges and aqueducts that could stand in conditions that would damage or destroy earlier designs. The first bridges were natural of huge rock arch that spans. These three types – beam, arch, and suspension have been known and built since ancient times and are the origins from which engineers and builders derived various combinations such as the truss, cantilever, cablestayed, tied-arch, and moveable spans. Rope bridges, a simple type of suspension bridge, were used by the Inca civilization in the Andes Mountains of South America.

Types:
Bridges can be categorized in several different ways. Common categories include the type of structural elements used, by what they carry, whether they are fix or movable and by the materials used. Now this paper would like to discuss about the structure of bridges. Bridges may be classified by how they forces of tension, compression, bending, torsion and shear are distributed through their structure. Bridges are classified as Beam bridges, Cantilever bridges, Arch bridges, Suspension bridges, Cable stayed bridges and Truss bridges.

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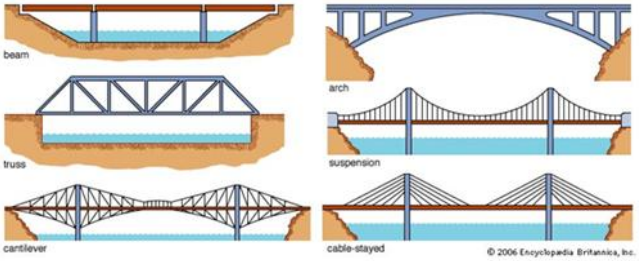

1. BEAM BRIDGE:

A horizontal beam supported at its ends comprises the structure of a beam bridge. The construction of a beam bridge is the simplest of all the types of bridges. The live example of a beam bridge is shown in figure Take a live example of Arpad Bridge or Árpád híd is a bridge in Budapest, Hungary, connecting northern Buda and pest across the Danube. It is the longest bridge in Hungary, opened on November 7, 1950.Spanning about 2 km (1.24 mi), longest span is 457.2 meters (1500 ft) with the sections leading up to the bridge, and 928 m (0.58 mi) without them. It is 35.3 m (116 ft) wide with pedestrian and bicycle paths.

2. CANTILEVER BRIDGE

- Cantilever bridges are built using cantilevers—horizontal beams that are supported on only one end. Most cantilever bridges use two cantilever arms extending from opposite sides of the obstacleto be crossed, meeting at the center.

Take a live example of cantilever bridge is BRIDGE OF GOD as shown in figure.

The Bridge of the Gods is a steel truss cantilever bridge that spans the Columbia River between Cascade Locks, Oregon, and Washington state near North Bonneville. It is approximately 40 miles (64 kilometers) east of Portland, Oregon, and 4 miles (6.4 km) upriver from the Bonneville Dam. It is a toll bridge operated by the Port of Cascade Locks.

2. ARCH BRIDGE:

The Arch Bridge is arch-shaped and has supports at both its ends. The weight of an arch-shaped bridge is forced into the supports at either end Take a live example of arch bridge is Henry Hudson Bridge.

Design	Double-decker arch bridge
Total length	2,208 ft (673 m)
Width	3 lanes (upper deck) 4 lanes (lower deck)
Longest span	841 ft (256 m)
Clearance above	12 ft (4 m)
Clearance below	143 ft (44 m)

The Henry Hudson Bridge is a steel arch toll bridge in New York City across the Spuyten Duyvil Creek. It connects Spuyten Duyvil inthe Bronx with Inwood in Manhattan to the south, via the Henry Hudson Parkway (NY 9A). On the Manhattan side, the parkway goes into inwood Hill Park. Commercial vehicles are not permitted on this bridge, since commercial vehicles are not accepted on the parkway in general.

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4. SUSPENSION BRIDGE:

A suspension bridge is a type of bridge in which the deck (the load-bearing portion) is hung below suspension cables on vertical suspenders. The first modern examples of this type of bridge were built in the early 19th century.[3][4] Simple suspension bridges, which lack vertical suspenders, have a long history in many mountainous parts of the world. Take a live example of Suspension Bridge Akashi Kaikyo Bridge.

The Akashi Kaikyō Bridge is a suspension bridge, which links the city of Kobe on the Japanese mainland of Honshu to Iwaya on Awaji Island. It crosses the busy Akashi Strait (Akashi Kaikyō in Japanese) as part of the Honshu-Shikoku Highway. It was completed in 1998, and has the longest central span of any suspension bridge in the world, at 1,991 meters (6,532 ft.; 1.237 mi). It is one of the key links of the Honshu-Shikoku Bridge Project, which created three routes across the Inland Sea.

5. CABLE STAYED BRIDGES:

A cable-stayed bridge has one or more towers (or pylons), from which cables support the bridge deck. A distinctive feature are the cables which run directly from the tower to the deck, normally forming a fan-like pattern or a series of parallel lines. This is in contrast to the modern suspension bridge, where the cables supporting the deck are suspended vertically from the main cable, anchored at both ends of the bridge and running between the towers. Take a live example of cable stayed bridge is Jingyue Yangtze River Bridge.

Total length	5,419 metres (17,779 ft)
Height	265 metres (869 ft) [1]
Longest span	816 metres (2,677 ft)

6. TRUSS BRIDGE:

A truss bridge is a bridge whose load-bearing superstructure is composed of a truss, a structure of connected elements forming triangular units. The connected elements (typically straight) may be stressed from tension, compression, or sometimes both in response to dynamic loads. Truss bridges are one of the oldest types of modern bridges. The basic types of truss bridges shown in this article have simple designs which could be easily analyzed by 19th- and early 20th-century engineers. A truss bridge is economical to construct because it uses materials efficiently.

The Royal Albert Bridge is a railway bridge which spans the River Tamar in England between Plymouth, Devon and Saltash, Cornwall. Its unique design consists of two 455-foot (138.7 m) lenticular iron trusses 100 feet (30.5 m) above the water, with conventional plate-girder approach spans. This gives it

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a total length of 2,187.5 feet (666.8 m). It carries the Cornish Main Line railway in and out of Cornwall. It was constructed on May 1854 and ended on April 1859 and opened on 2nd May 1859.

Conclusion:

I hereby conclude this paper revises different types of bridges and their characteristics that exists in real world.

Future scope:

The study of this paper create a gateway to design more structured bridges, taking the bases of bridges which where explained.