

# SAP ON

{30 Points}

**Due date: Wednesday, October 2, 2019, 23:59**

## PROBLEM STATEMENT

Bridges have been one of the most important parts of travel dating back to the primitive days. In order to cross rivers and valleys, bridges were needed. The first-century Romans greatly advanced these ancient ideas, with architectural masterpieces that are still standing today. In 2016 the average person crosses more than one bridge every day just on their way to work. Bridges are one of the most important parts of the transportation infrastructure, but also one of the costliest. As in most engineering projects, bridges need to be the safest they can be while still being cost-effective. This is why bridge design is of the utmost importance. Truss bridges are extremely effective because they have a high strength to weight ratio.

Design a most economical continuous Truss Bridge using SAP 2000 software satisfying the stated constraints.

- **Dimensions**

The Truss Bridge should have the following dimensions :

The Length of Span should be 100 m.

The width of the bridge should lie between 8 and 10 m.

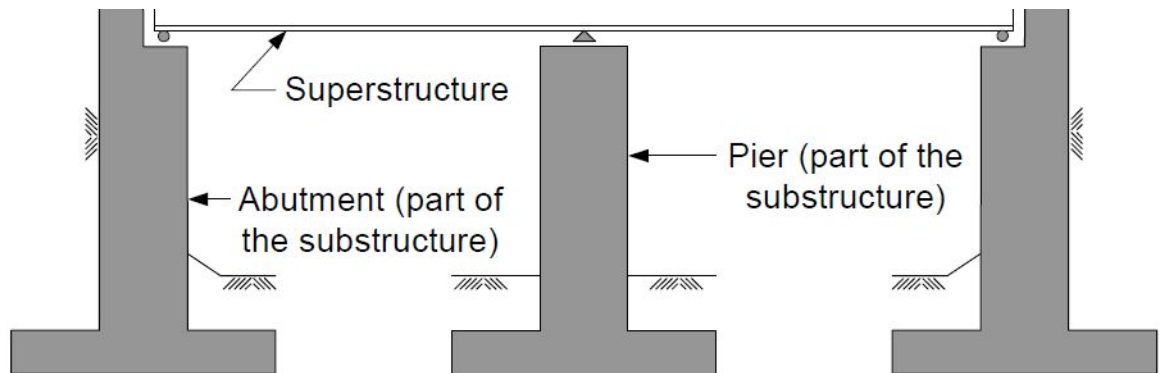
It should have a clearance of at least 7 m throughout its span.

You need to design the main truss and decide which kind of supports to place on the pier and main abutments.

Location of the pier is up to participants.

***\*\*In case of any discrepancies, the decision taken by the judges and the council will be the final verdict\*\****

Here superstructure represents your main truss.



### • Material and Weight requirements

1. The bridge can be made of any section and can be of any configuration, the choice of the section for truss members is up to participants
2. The material of the truss members can be chosen by participants in accordance with Indian Standards.
3. There is a cap on the weight of the bridge

### Event Structure

Single Round event, Maximum 2 teams are allowed from each pool.

Only one submission from each team will be accepted.

### Team Structure

A maximum of 2 people is allowed.

Only for second and third-year students.

### • Judging and Scoring

First, the structure will be reviewed to check if it violates any rules mentioned in the above sections. The scoring of the structure will be based on performance as well as aesthetics. In engineering, the best solution may not always be the biggest or strongest bridge.

### Scoring Elements:

#### a. DEFLECTION:

The deflection of the bridge will be checked for various combinations of concentrated and uniformly distributed live, dead and wind loads.

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**b. WEIGHT:**

The weight of the bridge will be calculated by the reaction forces.

**c. AESTHETICS:**

Up to the discretion of the Judges (based on the uniqueness of design and resemblance to actual engineering designs).

**d. REPORT:**

Each team have to submit a report(3-5 pages). The report should consist of details of your used material and all the analysis data (deformed shapes, joint forces, member forces, deflection values at each joint) under 50,000 KN Live Load.

**Scoring Criteria:****1. Deflection (D):**

100 points will be awarded to the team with the lowest deflection, 30 points to the team with the highest value of deflection, and all others will be awarded points based on linear interpolation between these two extremes.

**2. Weight (W):**

100 points will be awarded to the team with the lowest deadweight, 20 points to the team with the highest value of the weight, and all others will be awarded points based on linear interpolation between these two extremes.

**3. Aesthetics (A):**

Points for aesthetics (A) will be awarded by the judges out of 100.

**4. Report (R):**

Points for Report (R) will be awarded by the judges out of 100.

**Total Score:**

Total score (T) will be calculated as follows:

$$T=(D*0.35)+(W*0.25)+(A*0.15)+(R*0.25)$$

Violating any of the conditions mentioned above, a penalty will be imposed according to the judges and may lead to disqualification.

Dimensional specifications are not met (Penalty of 20% of the total score).

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Make a single zip folder with all your file(s) name it Pool name\_Team name.zip.

The folder should include -

(i) All the SAP 2000 file(s)

(ii) A PDF file(Report) of the shapes and the forces showing values under the given test load.

Send the zip file by e-mail to: **iitkdescon@gmail.com**

Mention team members name and roll number, failing to do so the team will be disqualified.

Evaluation of your submitted model will be on October 3, 2019.

At least one participant from each team should be present.

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