**CIVL 1100 Record Sheets for Structural Engineering Experiments**

**Table 1.** Experimental data for Three Pinned Arch Test

\*Percentage error = (Experimental–Theoretical)/Theoretical × 100%

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mass | Distance from left | Span Fraction | Experimental horizontal reaction | Theoretical horizontal reaction | Theoretical vertical reaction (at support A) | \*Percentage error in horizontal reaction |
| g | **mm** | **-** | **N** | **N** | **N** | **--** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**Table 2.** Experimental data for Redundant Truss Test (**Statically Determinate** Structure)

**Net strain (ε)** = Measured strain at different force level − Measured strain when Force = 0 N (initial strain)

# Negative net strain value represents compression

\*Actual force (F) = Young’s modulus (E) × Cross-sectional area of truss member (A) × **Net strain (ε)**

**For Force = 0 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |

**For Force = 50 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

**For Force = 100 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

Note: Displacement in virtual experiment is given in downward displacement

**Table 2.** (cont’d) Experimental data for Redundant Truss Test (**Statically Determinate** Structure)

**For Force = 150 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

**For Force = 200 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

**For Force = 250 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

**Table 3.** Experimental data for Redundant Truss Test (**Statically Indeterminate** Structure)

**For Force = 0 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |

**For Force = 50 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

**For Force = 100 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

**Table 3.** (cont’d) Experimental data for Redundant Truss Test (**Statically Indeterminate** Structure)

**For Force = 150 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

**For Force = 200 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |

**For Force = 250 N**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Member | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Measured strain (*με*) |  |  |  |  |  |  |  |  |
| \*Actual force (N) |  |  |  |  |  |  |  |  |
| Theoretical strain (*με*) |  |  |  |  |  |  |  |  |
| Theoretical force (N) |  |  |  |  |  |  |  |  |
| Displacement (mm) | (Hardware test) | | | | (Virtual experiment) | | | |