**Experiment 4: STATICS LAB**

**STATICS IN A PLANE: BEAM REACTIONS**

**BACKGROUND:**

**AIM OF STUDY:** To validate the law of statics equilibrium in a plane.

**LABORATORY EQUIPMENT:** The equipment for the experiment is a beam that is simply supported through a spring balances. Load hangers are provided on the beam. The hangers are moveable along the beam. Various masses are provided.

**EXPERIMENTAL PROCEDURE:** The left support is the reference marked O, the right support is marked E. The reactions on the beam are investigated under two types of load variation: The loads are varied at fixed locations (under fixed moment arms) and the moment arms are varied under a fixed load.

For the first experiment, the hangers marked H1, H2 and H3 are placed at the 20cm, 40cm and 80cm from O respectively. H1 is loaded in steps of 100g. H2 is loaded in alternate steps of 100g and 200g and H3 is loaded in steps of 200g. Six steps of experiment where carried out. The readings are tabulated below:

For the second experiment, the load is fixed at 3.6kg and the moment arm changes in steps of 10cm such that locations of the hanger are marked Hi where i = 1, 2, 3, ….

**RESULTS AND CALCULATIONS:** For the 1st Experiment:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| F1 [N] | F2 [N] | F3 [N] | RO,exp [N] | RE,exp [N] | RO,cal [N] | RE,cal [N] | %Error RO [%] | %Error RE [%] | %O  [%] | %E  [%] |
| 0.98 | 0.98 | 0.98 | 3.92 | 3.92 | 4.02 | 3.82 | 2.49 | -2.62 | 2.49 | 2.62 |
| 1.96 | 2.94 | 2.94 | 5.88 | 6.86 | 6.37 | 6.37 | 7.69 | -7.69 | 7.69 | 7.69 |
| 2.94 | 3.92 | 4.90 | 7.84 | 8.82 | 8.13 | 8.53 | 3.61 | -3.29 | 3.61 | 3.29 |
| 3.92 | 5.88 | 6.86 | 10.78 | 11.76 | 10.49 | 11.07 | -2.76 | -6.23 | 2.76 | 6.23 |
| 4.90 | 6.86 | 8.82 | 12.74 | 13.72 | 12.25 | 13.23 | -4.00 | -3.70 | 4.00 | 3.70 |
| 5.88 | 8.82 | 10.78 | 14.70 | 16.66 | 14.60 | 15.78 | -0.68 | -5.58 | 0.68 | 5.58 |
| 6.86 | 9.80 | 12.74 | 16.66 | 19.60 | 16.37 | 17.93 | -1.77 | -9.31 | 1.77 | 9.31 |
|  |  |  |  |  |  | Mean | 0.65 | -5.49 | 3.29 | 5.49 |

For the 2nd Experiment:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *I* | OHi | RO,exp [N] | RE,exp [N] | RO,cal [N] | RE,cal [N] | %Error RO [%] | %Error RE [%] | %O  [%] | %E  [%] |
| 1 | 10 | 20.58 | 4.90 | 34.20 | 5.98 | 39.82 | 18.06 | 39.82 | 18.06 |
| 2 | 20 | 18.62 | 6.86 | 30.67 | 9.51 | 39.21 | 27.87 | 39.21 | 27.87 |
| 3 | 30 | 16.66 | 8.82 | 27.15 | 13.03 | 38.64 | 32.31 | 38.64 | 32.31 |
| 4 | 40 | 14.70 | 10.78 | 23.62 | 16.56 | 37.76 | 24.90 | 37.76 | 24.90 |
| 5 | 50 | 12.74 | 12.74 | 20.09 | 20.09 | 36.59 | 36.59 | 36.59 | 36.59 |
| 6 | 60 | 10.78 | 14.70 | 16.56 | 23.62 | 34.90 | 37.76 | 34.90 | 37.76 |
| 7 | 70 | 8.82 | 16.66 | 13.03 | 27.15 | 32.31 | 38.64 | 32.31 | 38.64 |
| 8 | 80 | 6.86 | 18.62 | 9.51 | 30.67 | 27.87 | 39.21 | 27.87 | 39.21 |
| 9 | 90 | 4.90 | 20.58 | 5.98 | 34.20 | 18.06 | 39.82 | 18.06 | 39.82 |
|  |  |  |  |  | Mean= | 33.91 | 32.80 | 33.91 | 32.80 |

**OBSERVATIONS:**

**PRECAUTIONS:**

* Wearing a safety outfit when entering lab like wearing a lab outfit and safetyboots.
* Follow all the lab rules.
* Do not play when doing an experiment.
* Follow the procedure of experiment.")
* Repeat the procedures to avoid error.5)
* Read the meter two to three times to avoid error.

**CONCLUSION**