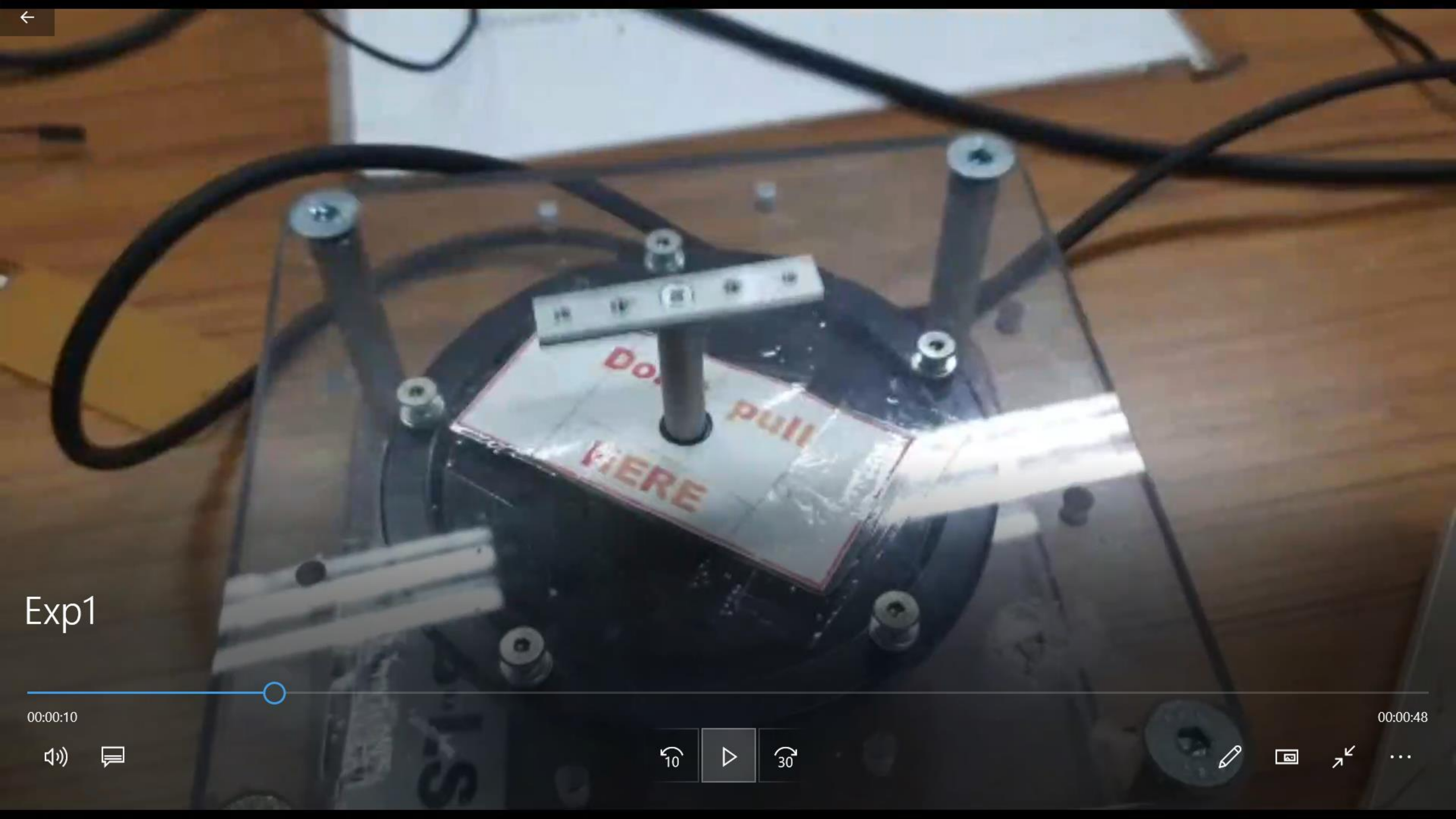
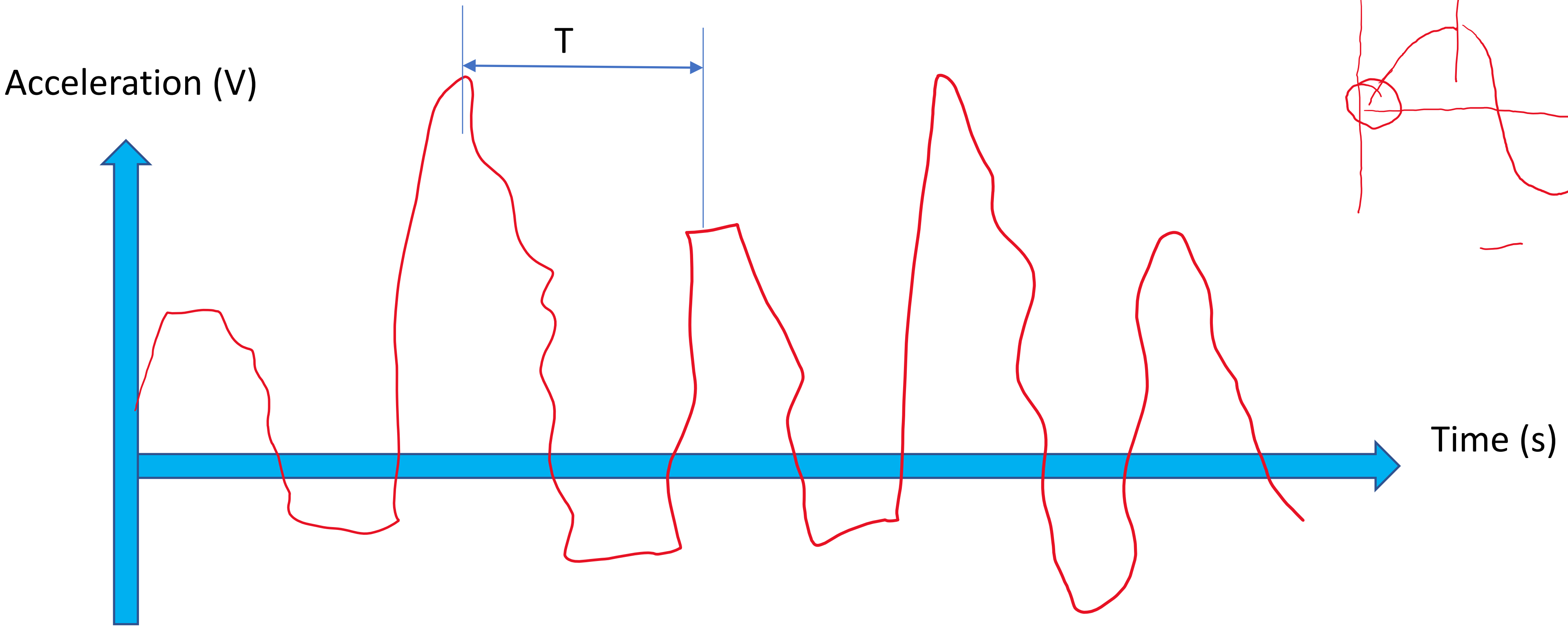
CVL 861

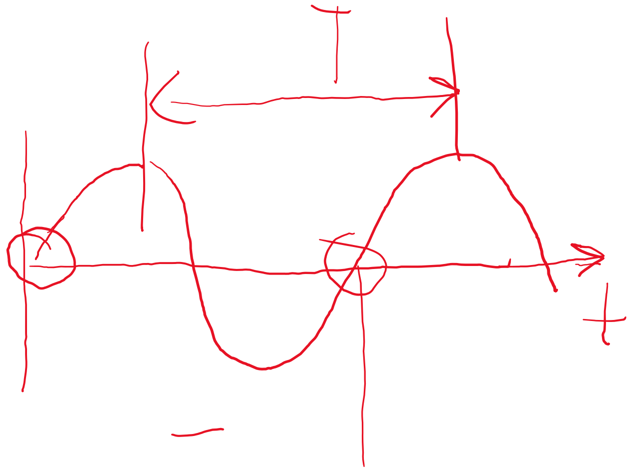
EXPERIMENT 1


Exp1
00:00:10
00:00:48
pull
ERE

OBJECTIVE:

To identify machine type, record induced vibrations fromsurroundings, and determine operating frequency





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EXPERIMENT 2

OBJECTIVES:

To identify machine type, record vibrations from surroundings, determine operating frequency and check if vibrations are within limit

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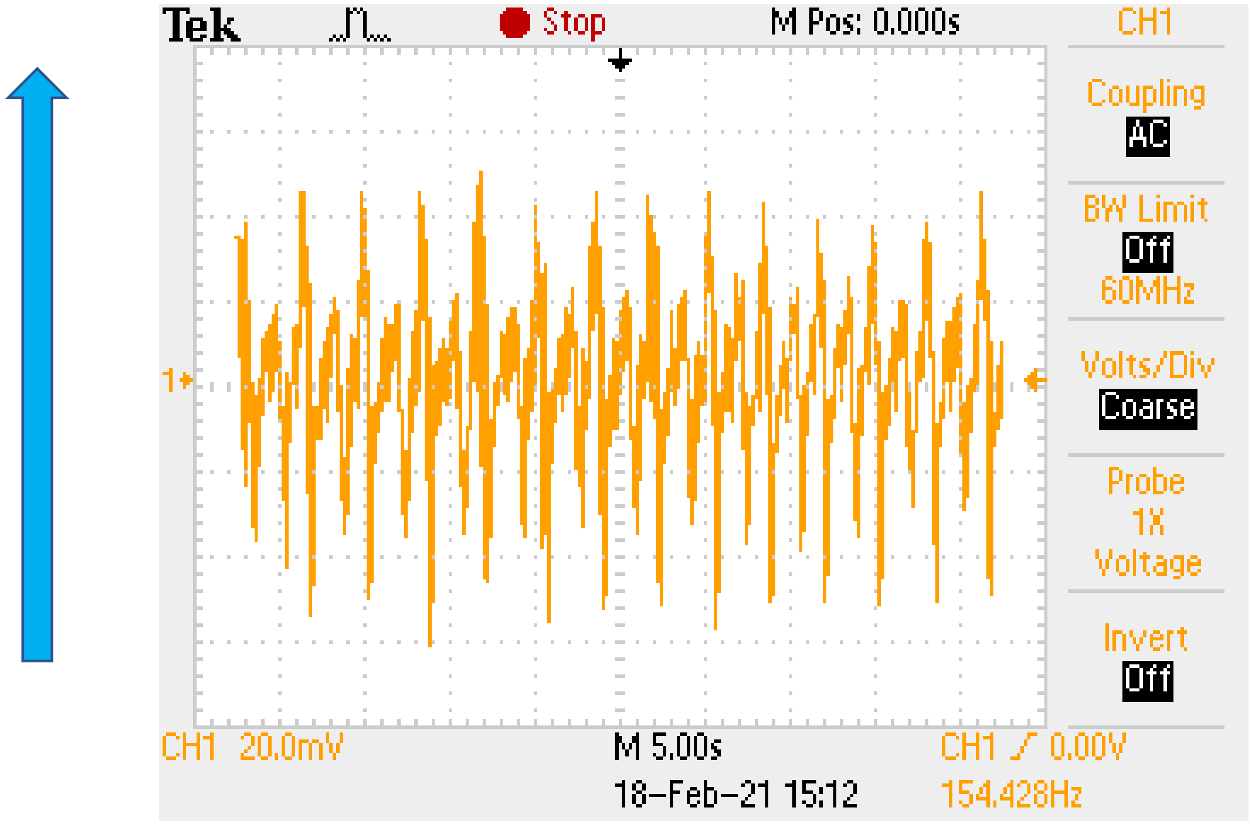
To identify machine type, record vibrations from surroundings, determine operating frequency and check if vibrations are within limit

Acceleration (V)



Time (s)

COMPUTATIONAL APPROACH:

Use both "time period" method and "fast Fourier transform"

MATLAB COMMANDS:

```
Vfft= abs(fft(V))         %Converting time domain signal into frequency domain

f=(0:N-1)/(N*T)           %Corresponding frequency points, N: Total no of data points, T= Sampling time
```

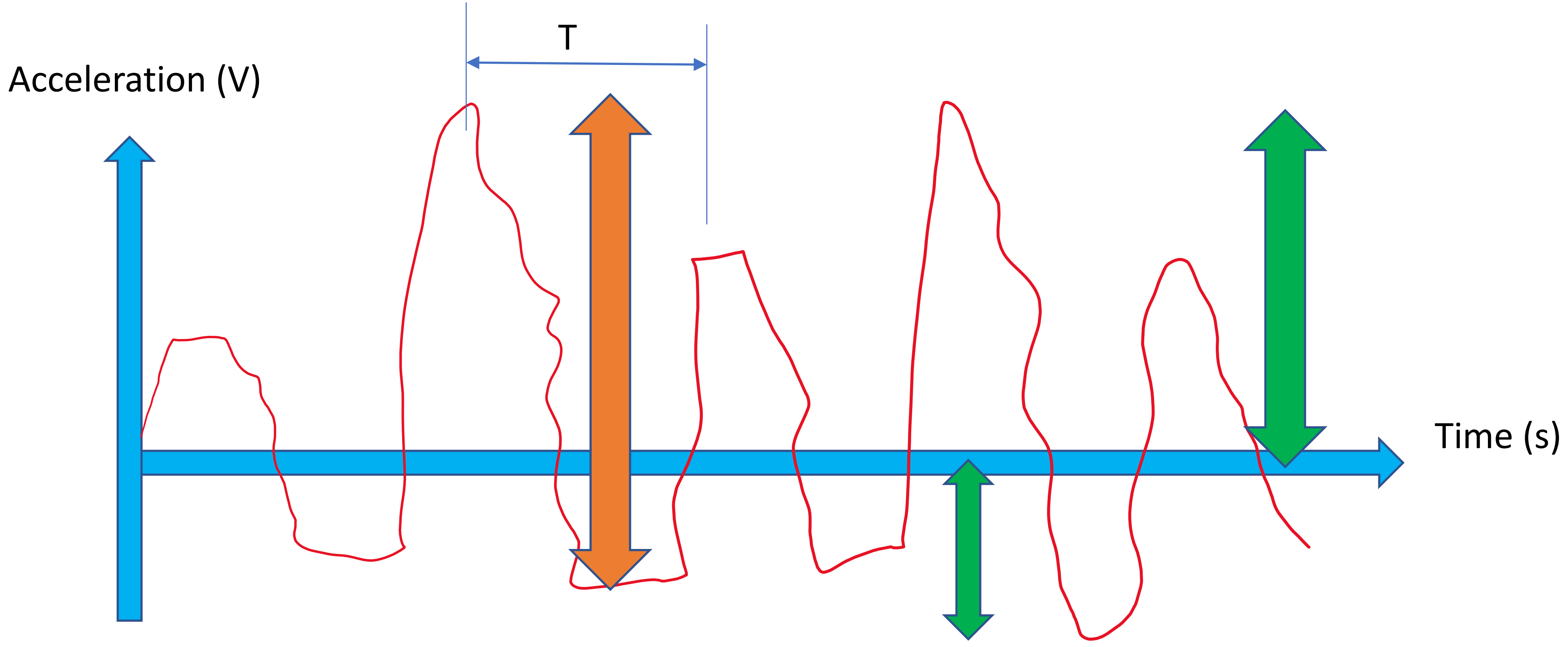
How to obtain displacement ???

$$d = \frac{a}{\omega^2}$$

Sensitivity= 100 mV/g

Calibration constant = 98 ms^{-2}/V

HOW TO FIND ACCELERATION AMPLITUDE??



Find peak to peak displacement……..

Amplitude= 0.5* (peak to peak displacement)

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EXPERIMENT 3

OBJECTIVE:

To experimentally measure coefficient of elastic uniform compression


HYBRID PASSIVE ENERGY
DISSIPATION DEVICE FOR
MULTIPURPOSE CONTROL
OF STRUCTURES
07
LDS


FUNCTION GENERATOR
LDS

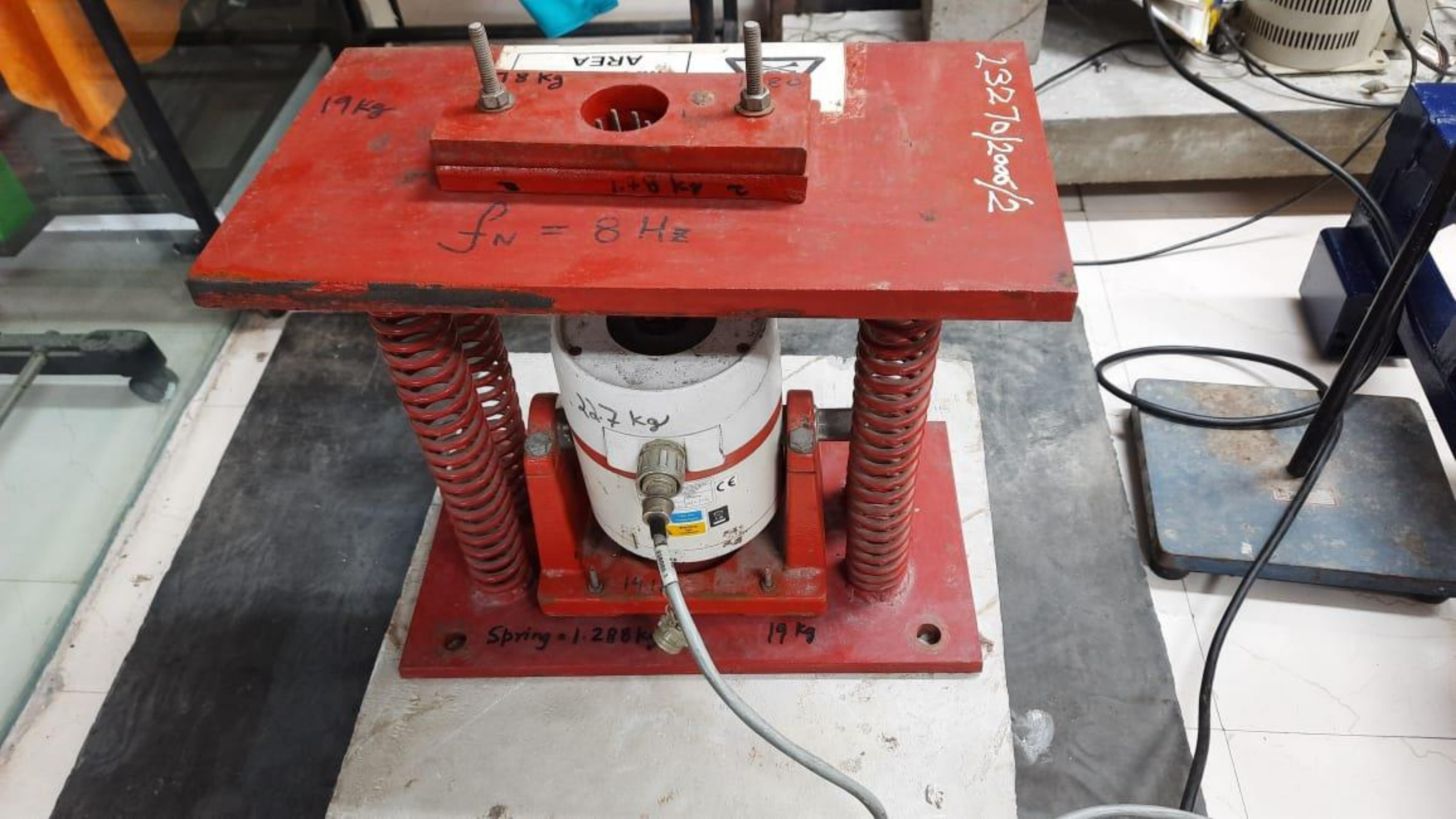

PA 500L
CONTROL
ON
READY
STOP
FAULT DESCRIPTION
OUTPUT DC OFFSET
OUTPUT STAGE FUSE BLOWN
PEAK OUTPUT VOLTAGE OVER PRE-SET LIMIT
RMS OUTPUT CURRENT OVER PRE-SET LIMIT
SIGNAL PRESENT IN STAND-BY STATE
OUTPUT TRANSISTOR OVER-TEMPERATURE MODULE 1
USER INTERLOCK
FIELD POWER SUPPLY
BLOWER FAIL
OVERTRAVEL
SELECT
MODE
OVERCURRENT
SET
07
GAIN
VOLTAGE
CURRENT
INTERLOCK
LDS
LDS PA500L

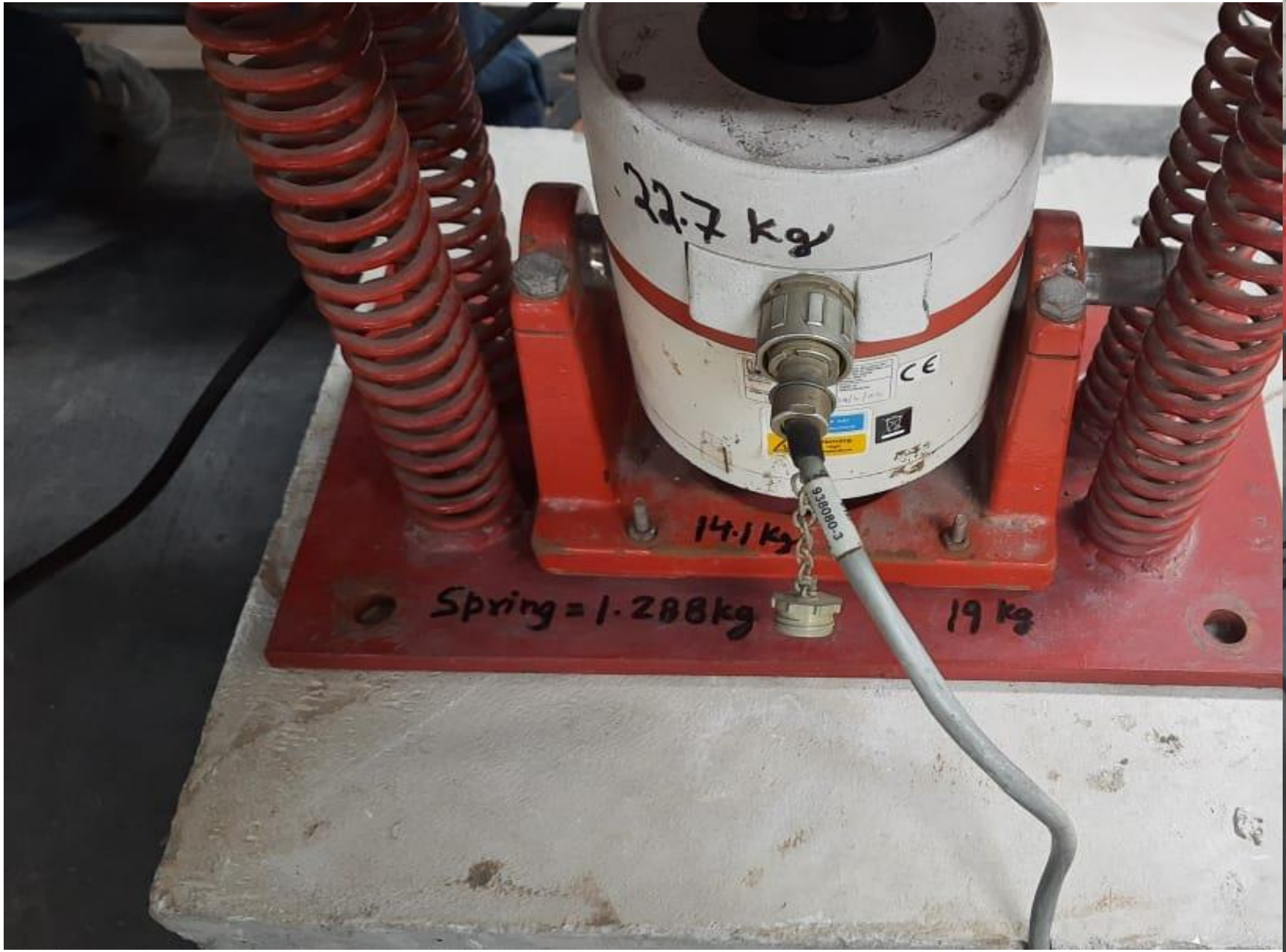
AMPLIFIER


STINGERS
SHAKER

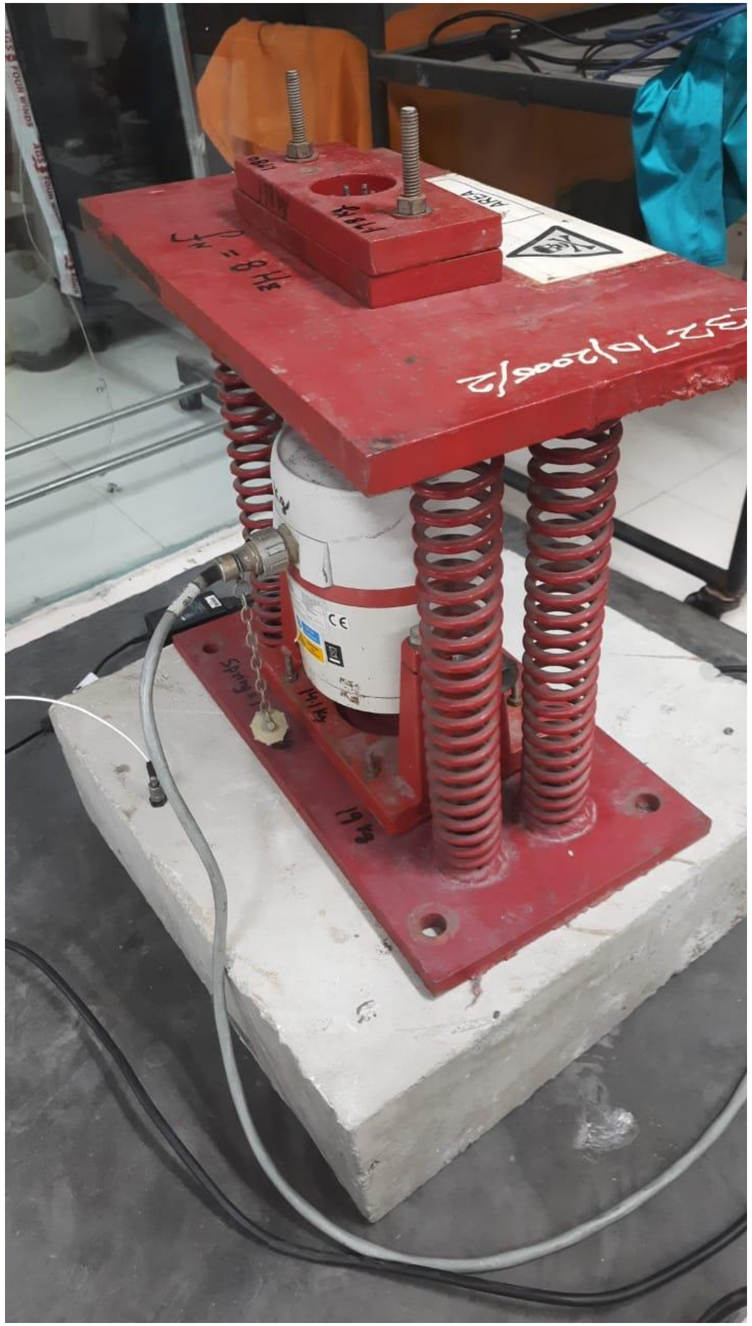

ACCELEROMETER
SENSOR SIGNAL CONDITIONER
PCB PIEZOTRONICS
MODEL 482C SERIES
SENSOR SIGNAL CONDITIONER
2015-S-B-L-S-26
POWER
LDS


OSCILLOSCOPE
LDS


19 kg
$f_N = 8 Hz$
23270/2005/2
22.7 kg
Spring = 1.288 kg
19 kg


22.7 kg
CE
14.1 kg
Spring = 1.288kg
19 kg


19 kg
1.78 kg
22.7 kg
14.1 kg
Spring = 1.288kg
19 kg



PROCEDURE

- Direct method of determining C_z
- Acceleration response available at various excitation frequencies
- Obtain f_N
- Follow remaining computational procedure already described in theory class
- Every student shall be allotted different time interval

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- Acceleration response available at various excitation frequencies
- Obtain f_N
- Follow remaining computational procedure already described in theory class
- Every student shall be allotted different time interval

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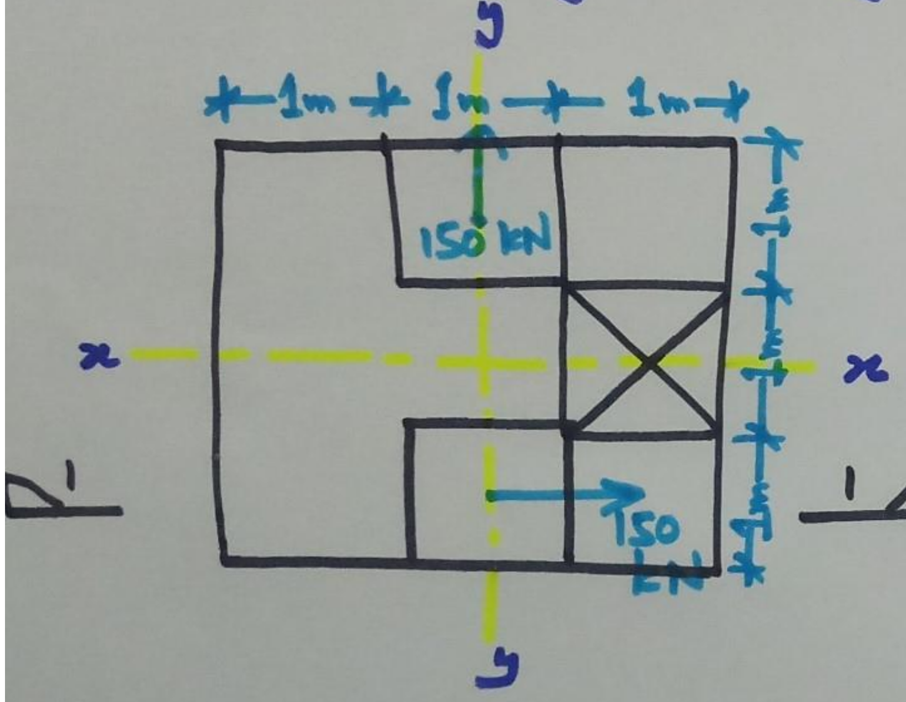
EXPERIMENT 4

OBJECTIVE:

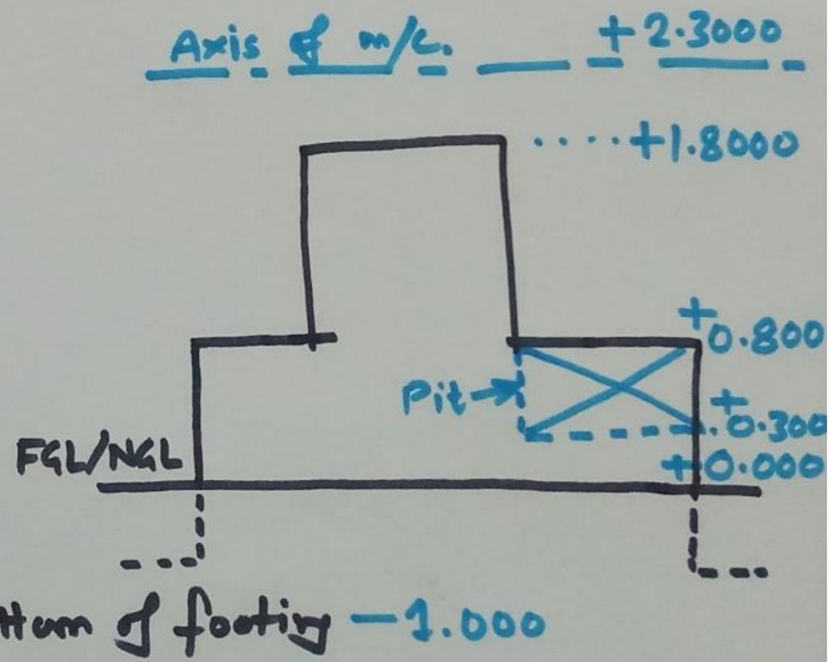
To analyse and design foundation for a reciprocating machine

EXPERIMENT - 4

OBJECTIVE : To analyse and design the machine foundation for reciprocating machine.



PLAN



SEC 1-1

Total mass of m/c = 4000kg (equally distributed into 2 parts)

Operating frequency = 600 RPM

$C_z = 4 \times 10^4$ kN/m³

$\sigma_{all, net} = 200$ kN/m²

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EXPERIMENT 5

OBJECTIVE:

To determine transmissibility

EXPERIMENT 5

24/03/21

OBJECTIVE: To determine transmissibility of a machine

METHODOLOGY:

1) Use readings of Exp. 3 to obtain f_N
2) Determine ξ
3) f_m : Different for each student 5 Hz to 75 Hz
4) Use expression for –
   - (a) Exact value of ξ
   - (b) Ignore ξ.

CONCLUDE/INFER:

Give your opinion on the value of 'T' calculated.

Suggest measures of reducing 'T'

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EXPERIMENT 6

OBJECTIVE:

To implement vibration isolation for a machine

SUPPORTED ON STIFF BEARINGS T> 100%

EXPERIMENTAL SET UP

OPERATION OF MACHINE ON STIFF BEARINGS

INSTALLATION OF RUBBER PADS AS INTERFACE

100x100x50 mm GRADE 50^{O}

T = ??

OPERATION OF MACHINE WITH RUBBER PADS

COMPUTATIONS

- Determine the average acceleration amplitude of vibrations before and after installation of rubber pads
- Force transmitted before placement $F_1 = m_F\ a_1$
- Force transmitted after placement $F_2 = m_F\ a_2$
- Reduction in transmissibility (%) = $(F_2 - F_1)/\ F_1$
- Compare with theoretical values in the two cases and comment

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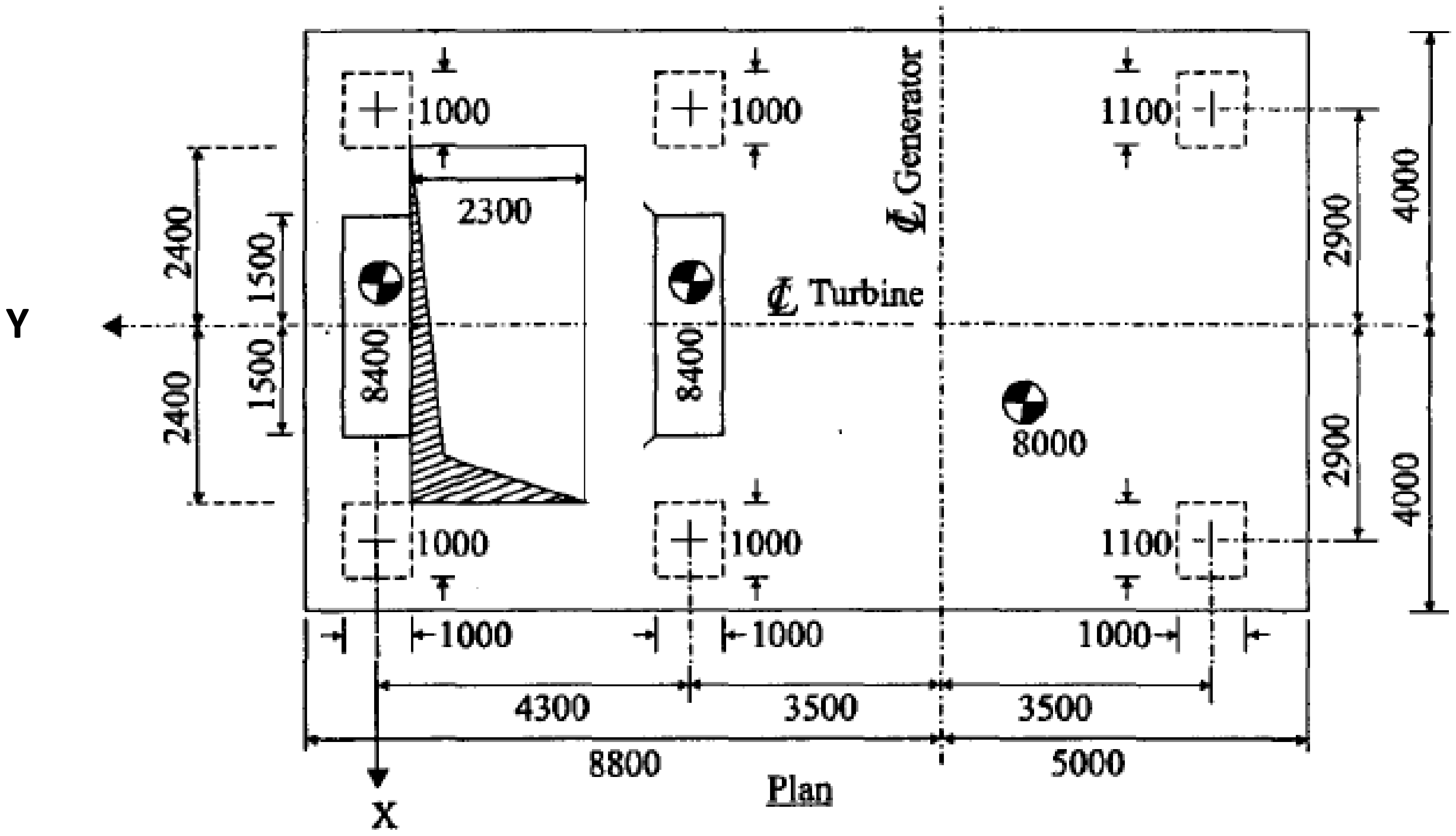
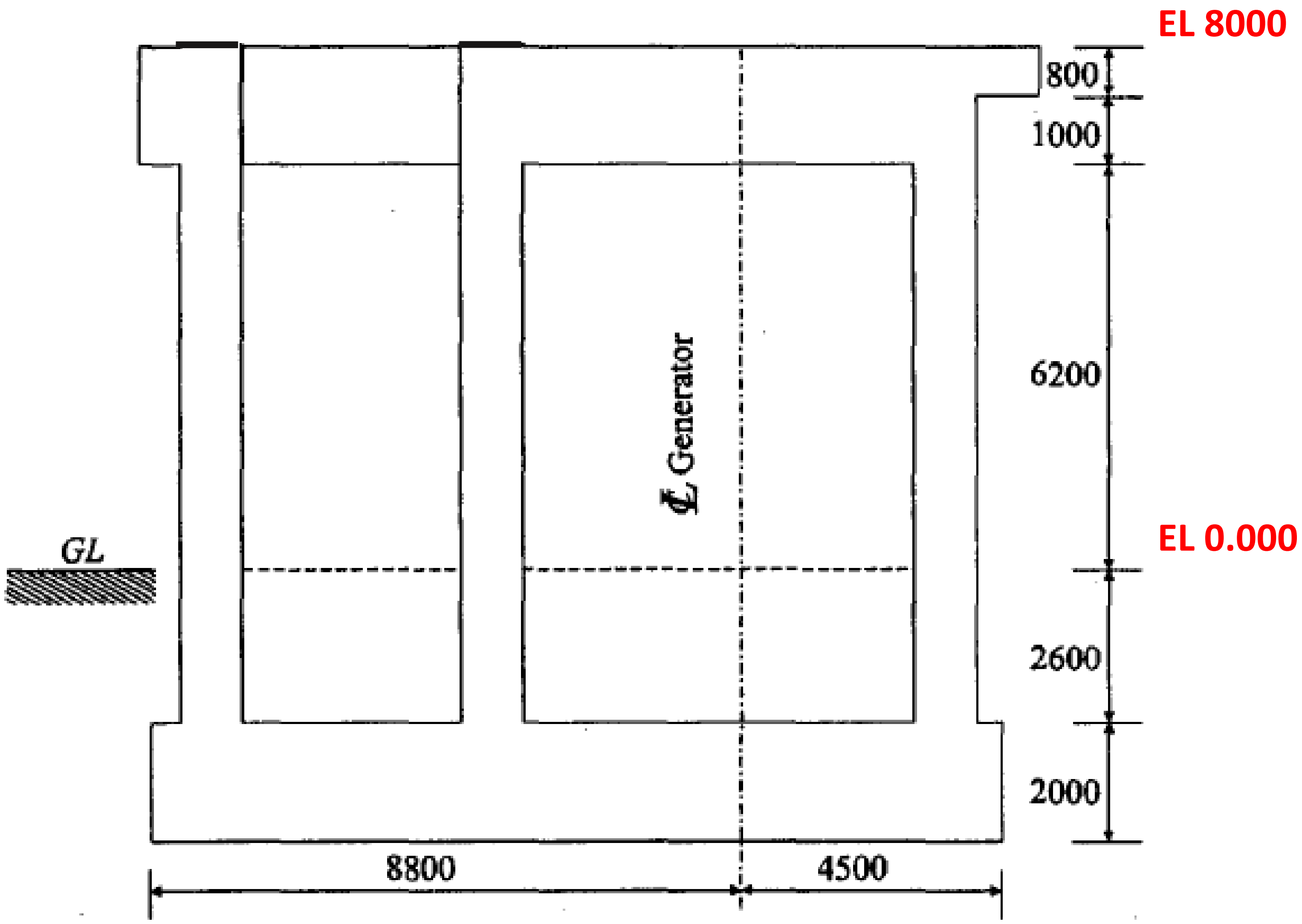
EXPERIMENT 7 (Computational)

OBJECTIVE:

3D MODAL ANALYSIS OF FRAME TYPE FOUNDATION OF A TURBO GENERATOR

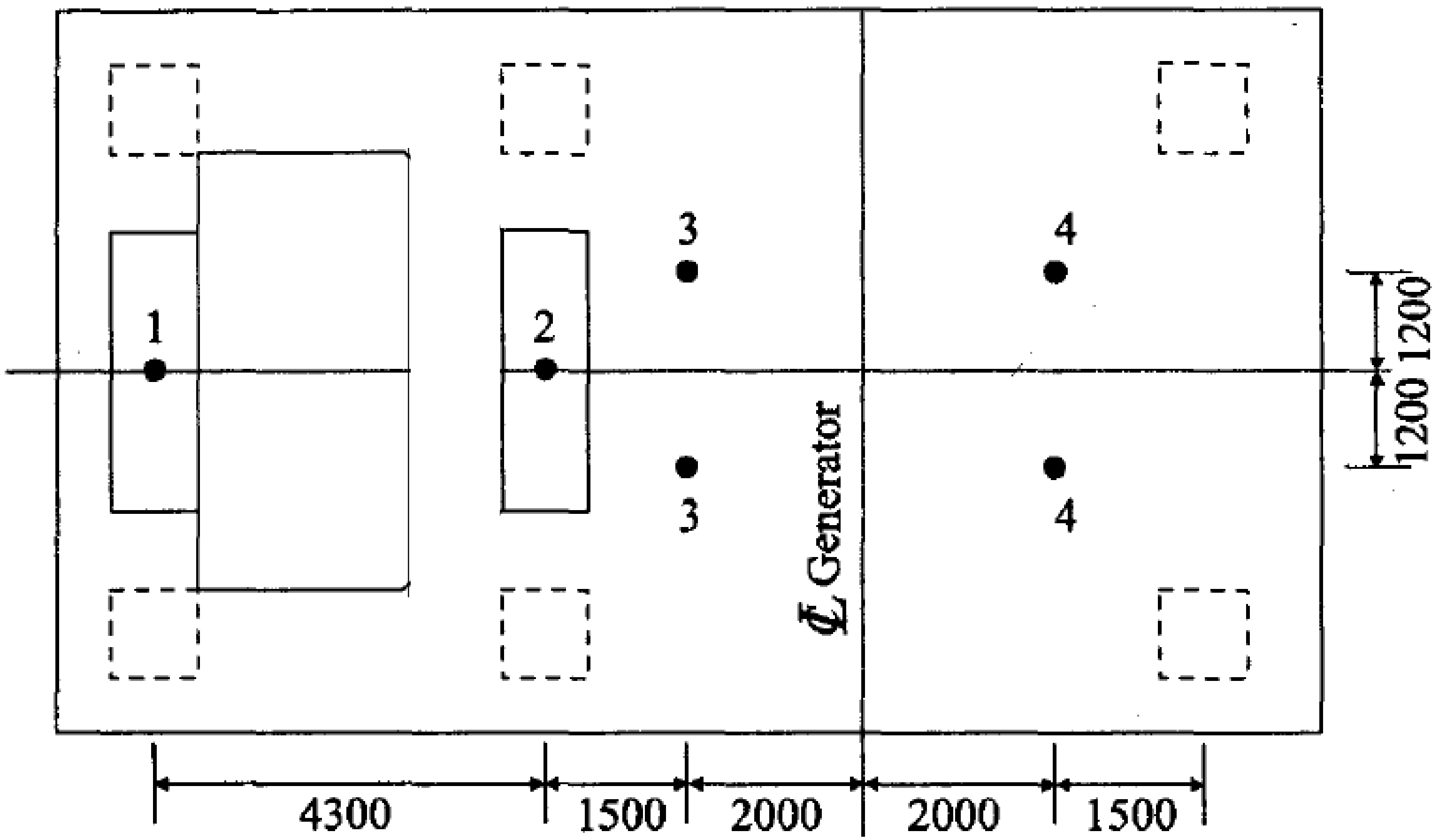


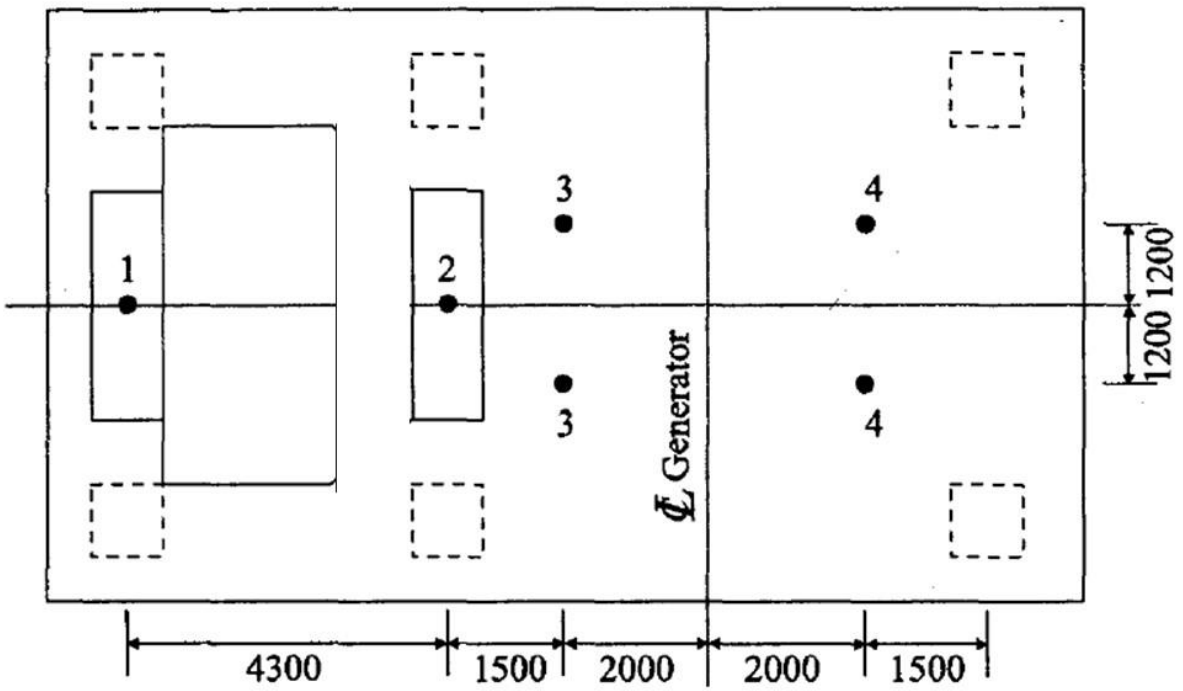
Concrete grade M 35
Operating frequency 50 Hz



Sectional Elevation

LOADING POINTS





Machine Data

Machine Weight (Total including Rotor)

Turbine @ Bearing 1	400.00 kN
Turbine @ Bearing 2	360.00 kN
Generator Seating Plate location 3 -1	100.00 kN
Generator Seating Plate location 3 -2	100.00 kN
Generator Seating Plate location 4 -1	100.00 kN
Generator Seating Plate location 4 -2	100.00 kN
Total Machine weight	1160.00 kN

EXPECTATIONS

- Do modelling using both line and 3D brick elements
- Determine relevant natural frequencies and mode shapes
- Perform frequency check
- Compare the results of two modelling approaches

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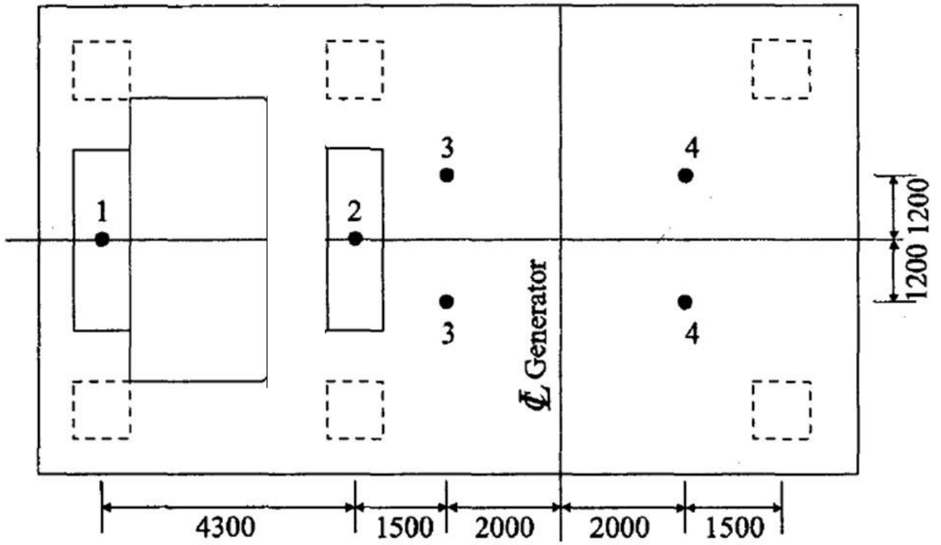
EXPERIMENT 8 (Computational)

OBJECTIVE:

3D HARMONIC ANALYSIS OF FRAME TYPE FOUNDATION OF A TURBO GENERATOR

Machine Operating Speed	50.00	Hz
Unbalance Force		
Along z (Vertical)		
Turbine @ Bearing 1	5.00	kN
Turbine @ Bearing 2	7.00	kN
Generator Seating Plate location 3 -1	7.50	kN
Generator Seating Plate location 3 -2	7.50	kN
Generator Seating Plate location 4 -1	7.50	kN
Generator Seating Plate location 4 -2	7.50	kN
Total Unbalance Force along Y (Vertical)	42.00	kN

Along X (Lateral)		
Turbine @ Bearing 1	5.00	kN
Turbine @ Bearing 2	7.00	kN
Generator Seating Plate location 3 -1	7.50	kN
Generator Seating Plate location 3 -2	7.50	kN
Generator Seating Plate location 4 -1	7.50	kN



Machine Load points

Load point	1	2	3	4	Total (kN)
Total M/C WT	400	360	200	200	1160 kN
Rotor WT	25	35	70	70	200 kN
Unbalance Lateral/Vertical	5	7	15	15	42 kN
Longitudinal	2	3	6	6	17 kN
Blade loss force	3	11	—	—	14 kN

Short Circuit Torque 2160 kNm

EXPECTATIONS

- Do modelling using both line and 3D brick elements
- Determine amplitudes under operating loads
- Check for codal compliance
- Compare the results of two modelling approaches