K J Somaiya College of Engineering, Mumbai-77

(Autonomous College Affiliated to University of Mumbai)

Batch: Roll No.: 16010221025
Experiment / assignment / tutorial No.__6__
Grade: AA / AB / BB / BC / CC / CD /DD

Signature of the Staff In-charge with date

Title: Coplanar Concurrent Force System

CO3 Analyze applications of equilibrium using free body diagram

Objective

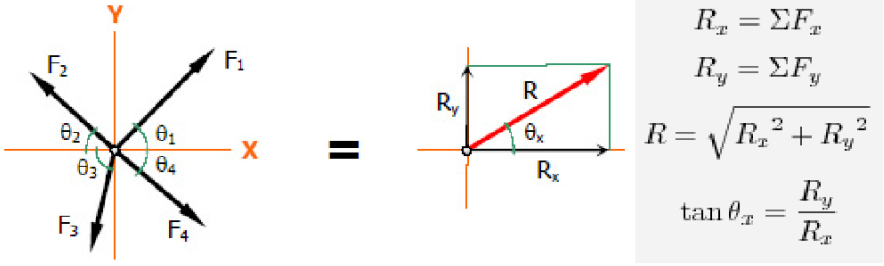
To verify the condition of equilibrium of a coplanar concurrent forces .

Theory

Resultant of a force system is a force or a couple that will have the same effect to the body, both in translation and rotation, if all the forces are removed and replaced by the resultant.

Resultant of Coplanar Concurrent Force System

The lines of action of each force in coplanar concurrent force system are on the same plane. All of these forces meet at a common point, thus concurrent. In x-y plane, the resultant can be found by the following formulas:



$$R_x = \Sigma F_x$$
$$R_y = \Sigma F_y$$
$$R = \sqrt{{R_x}^2 + {R_y}^2}$$
$$\tan\theta_x = \frac{R_y}{R_x}$$

AIM:

To verify the condition of equilibrium of a coplanar concurrent system of forces and analyse the error if any.

Department of Mechanical Engineering

APPARATUS:

Universal force table, Weights and Spirit level.

Setup Diagram:

PROCEDURE:

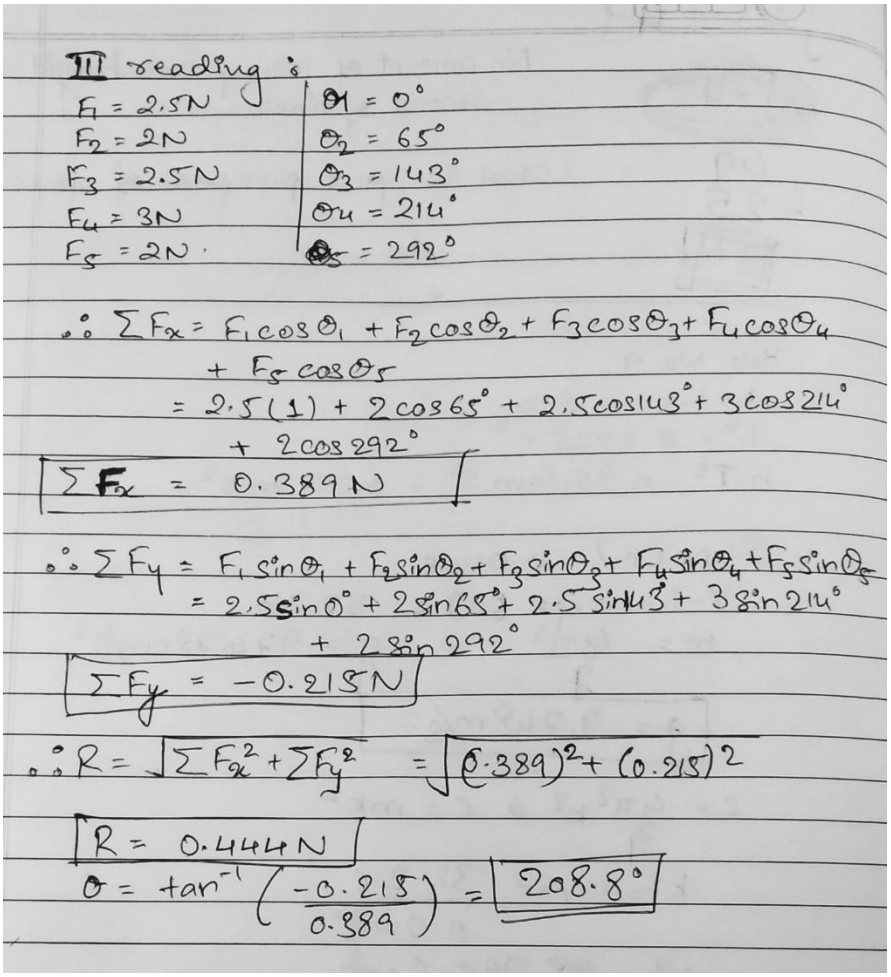
1. Place the Universal force table on the firm platform.
2. Make the circular disc in horizontal position with the help of foot screws.
3. Put slotted weights to each hanger to these ends of strings passing over the pulleys.
4. Note the sum of slotted weights in each hanger and weight of hangers as five forces F1, F2,F3,F4 and F5.
5. Measure the angles included between the two adjacent pulleys and note them as Θ1 to Θ5.
6. Record these observations.

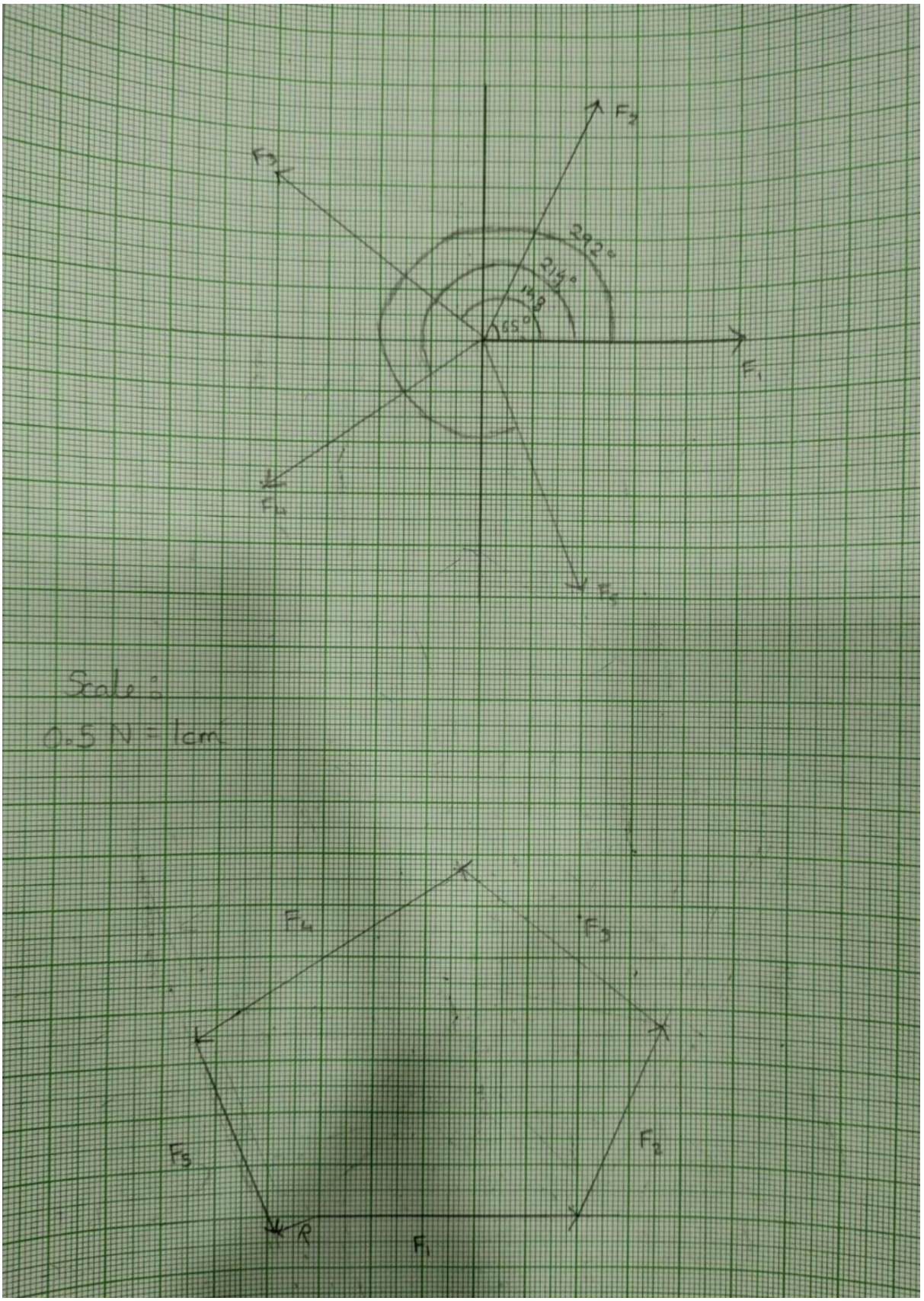
7. Repeat by changing any one or two pulley positions and take three sets of readings.
8. Draw force polygon.

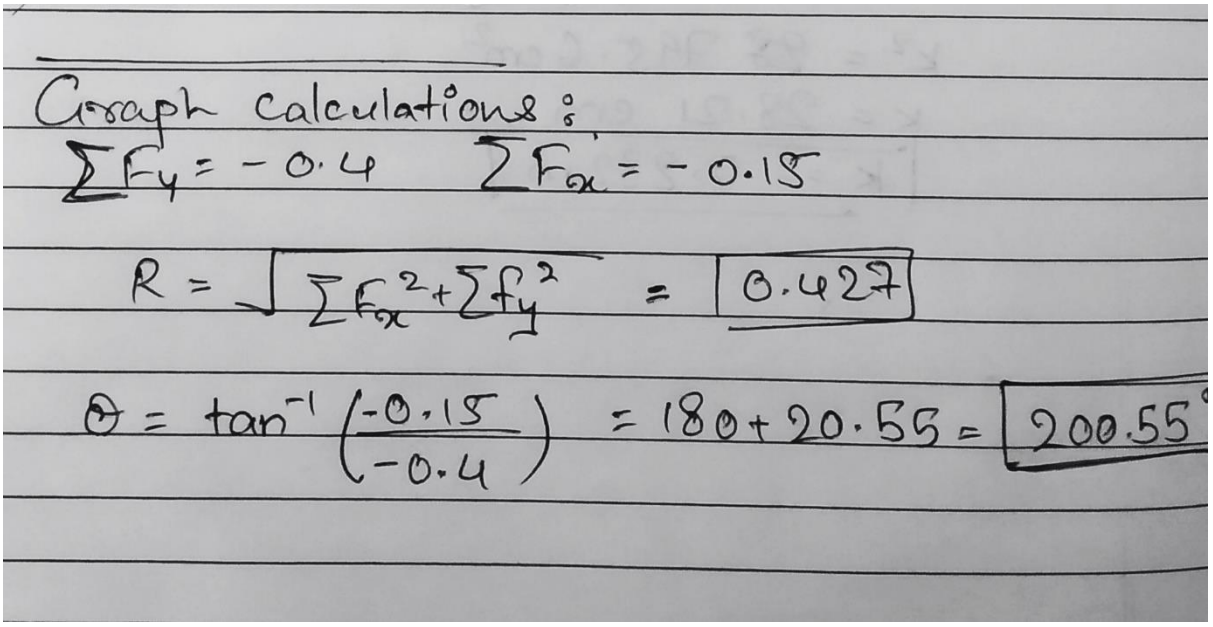
OBSERVATION TABLE:

Sr No	Forces					Angles					∑Fx	∑Fy
	F1	F2	F3	F4	F5	Θ1	Θ2	Θ3	Θ4	Θ5		
1	3.43	1.96	3.43	2.94	2.45	0	65	142	213	292	0.007	0.015
2	2.5	2	2.5	2.5	3	0	65	129	199	280	-0.071	-0.012
3	2.5	2	2.5	3	2	0	65	143	214	292	-0.389	-0.215

CALCULATION:




F3
F2
292°
214°
138°
65°
F1
F4
F5
Scale:
0.5 N = 1cm
F4
F3
F5
F2
R
F1



RESULT:

For Set 3:

Analytical Results:

ΣFx= -0.389 N
ΣFy= -0.215 N
R= 0.444 N
Θ= 208.8°

Graphical Results:

ΣFx= -0.4 N
ΣFy= -0.15 N
R= 0.427 N
Θ= 200.55

CONCLUSION:

We experimented the condition of equilibrium of a coplanar concurrent system of forces.

Signature of faculty in-charge