EXPERIMENT NO : 4
PARALLELOGRAM LAW OF VECTORS

Aim: To find the weight of a given body using parallelogram law of vector addition.

Apparatus: Gravesand's apparatus, three hangers, weights, thin strong thread, white drawing paper sheet, mirror strip, sharp pencil, half metre scale, set squares, protractor.

Theory: If the body of unknown weight W suspended from middle hanger, balances weights P and Q suspended from other two hangers, then $P + Q + W = 0$

$$\text{Or} \quad W = - (P + Q)$$
$$W = |R| \quad (R - \text{resultant vector})$$

The unknown weight must have a magnitude equal to the resultant of the other two known weights.

Procedure:
1. Set up the Gravesand's apparatus with its board vertical.
2. Fix the white drawing paper sheet on the board.
3. Put a thread over the rims of the pulleys and attach some weights P and Q at its ends.
4. Tie another thread at the middle of the thread passing over the pulleys and attach a known weight S in such a way that the knot is nearly in the middle.
5. Mark the position of the junction as O.
6. Keeping mirror strip length wise under each thread, mark the position of the ends the image of thread in the mirror, covering the image by the thread (this removes parallax error).The positions are P_1, P_2 for thread of weight P, Q_1 and Q_2 for the thread of weight Q and S_1, S_2 for thread of weight S.
7. Remove paper from the board.
8. Draw lines through points P_1 and P_2 to represent P, through points Q_1 and Q_2 to represent Q and through points S_1 and S_2 to represent S. These lines must meet at point O.
9. Taking a suitable scale (say, 1 cm = 10 gwt.) ,represent P and Q .
10. Complete parallelogram OACB and join OC. It represents R.
11. Calculate the magnitude of the resultant vector
12. Calculate the weight of the body.
13. Repeat the experiment with unequal weights on both sides.

Result : The weight of the given body = _____ g wt.

Precautions:
1. The board should be stable and vertical
2. The pulleys should be frictionless.
3. The weights should not touch the board but hang freely.
4. Points should be marked with sharp pencil.
5. Junction O should be at the middle of the paper

Sources of error:
1. Pulleys may have friction
2. Weights may not be accurate
3. Points may not be marked correctly

Eby P Kurien
eby@selltheshell.com

Observation and calculation:

For equal weights :

Scale : 1cm = _____ g wt.

Sr. No.	Force		Sides			Resultant Force R (g wt)	Weight W (g wt)
	P (g wt)	Q (g wt)	OA (cm)	OB (cm)	OC (cm)		
1.							
2.							

For unequal weights :

Scale : 1cm = _____ g wt.

Sr. No.	Force		Sides			Resultant Force R (g wt)	Weight W (g wt)
	P (g wt)	Q (g wt)	OA (cm)	OB (cm)	OC (cm)		
1.							
2.							

Eby P Kurien
eby@selltheshell.com