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Application of Edge Labelling in Varignons Theorem for Parallel Forces

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***Abstract*—Varignons theorem is "The algebraic sum of the moment of two forces about any point in their plane is equal to the moment of their resultant about that point". Here we apply edge labelling in forces and distance.**

***Index Terms*— Force, labeling, Moments, Parallel Force**

INTRODUCTION

Graph labelling is an bustling region of research in graph theory. Which is essentially yield through its diligent work in coding theory, communication networks, radar and graph decomposition problems. Beieke and Hegde[1]stated by graph labelling srves as a border line of number theory and structure of graphs. For a vital survey of various graph labelling problems along with an broad bibiliography we refer to Gallian [2]. Varignon's theorem is a method for calculating moments developed in 1687 by the French Mathematician Pierre Varignon(1654-1722).This theorem was published in 1731 by French academics in the book elements de Mathematic [3] .In 2001 describes the area formed from the varigmon's theorem [4]

Definition 1.1

A graph G is an ordered triadic $(V(G), E(G))$ conforming of a nonempty set V(G) of vertices, a set E(G) disjoint from V(G) of edges and an prevalence function $\psi_G$that associate with each edges of G an unordered brace of vertices of G.

Definition 1.2

A graph labelling is an assignment of integers to the vertices or edges or both subject ton certain condition. Any graph labelling will have the following three characteristic

- A set of figures from which the vertex labels are choosen
- A rule that assigns a value to each edge
- A condition that these value must satisfy

Definition 1.3

An edge labelling is a functionof E to a set of labels. In this case the graph is called edge labelled graph.

Definition 1.4

Force is an external agent capable of changing a body's state of rest or stir . It has a magnitude and direction

Definition 1.5

Parallel forces lies in the same plane and have line of action that never intersect each other.

The parallel forces may be broadly classified into the following catagoroies depending their direction

(i)Like Parallel fores:

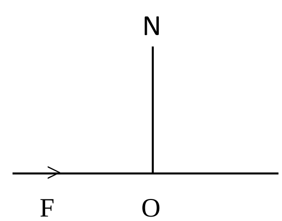
The forces whose line of action are parallel to each other and all of them act in the same direction are known as parallel forces

(ii)Unlike parallel forces:

The forces whose line of actions are parallel to each other and all of them do not act in the same direction are known as unlike parallel fores.

Definition 1.6

The moment of a force about a point is defined as the product of the fore and the perpendicular distance of the point from the line of action of the force



Moment of a fore F about O =$\vec{F} \times ON$

Definition 1.7

If the force tend to turn the body in the anticlockwise direction moment is positive, if the force tends to turn rthe body in the clockwise direction moment is negative.

Varignon's Theorem of moments:-

Statement:-

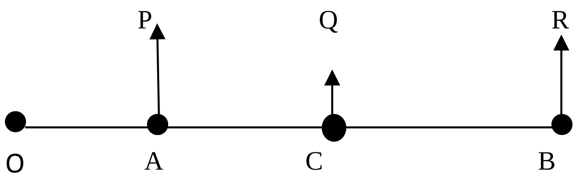
The algebraic sum of the moment of two forces about any point in their plain is equal to their resultant about that point.

Proof:

Let the forces be parallel

Case(i)

O outside AB



Let P and Q be two parallel forces acting at A and B. $P+Q=R$ is the resultant acting at C such that $P.CA=Q.CB$

Algebraic sum of the moment

about O $=P.OA+Q.OB$

$= P(OC-AC)+Q(OC+CB)$

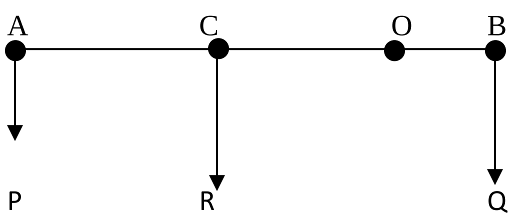
$= P.OC-P.AC+Q.OC+Q.CB$

$= (P+Q)O = R.OC$

$= Moment\ of\ R\ about\ O$

Case(ii)

O inside AB



Let P and Q be two parallel forces acting at A and B. $P+Q=R$ is the resultant acting at C such that $P.CA=Q.CB$

Algebraic sum of the moment

about O $=P.OA-Q.OB$

$=P(OC+AC)-Q(CB-OC)$

$=P.OC+P.AC-Q.CB+Q.OC$

$=(P+Q)OC$

$=R.OC$ =

$Moment\ of\ R\ about\ O$

Application :-

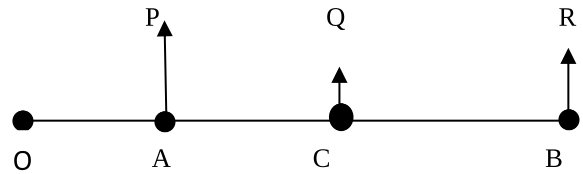
If Q is double of P ,the distance AC=2CB and the distance OA=AC (or) OA=BC then Varignon's theorem is true.

Proof:

Let the forces be parallel

Case(i)

O outside AB



Let P and Q be two parallel forces acting at A and B. $P+Q=P+2P=3P=R$ is the resultant acting at C such that $P.CA=Q.CB$

Algebraic sum of the moment

about O= $P.OA+Q.OB$

$=P.OA+2P.OB$

= P.(OC- AC)+2P.(OC+ CB)

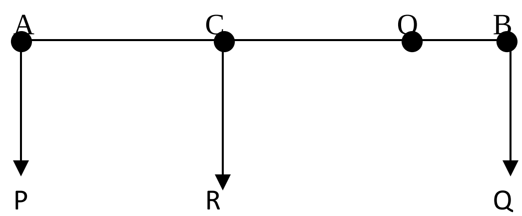
$=P.OC-P.AC+2P.OC+2P.\frac{1}{2}AC$

= 3P.OC =R.OC

=Moment of R about O

Case(ii)

O inside AB



Let P and Q be two parallel forces acting at A and B. $P+Q=P+2P=3P=R$ is the resultant acting at C such that $P.CA=Q.CB$

Algebraic sum of the moment

about O= $P.OA-Q.OB$

$=P.OA-2P.OB$

$=P.(OC+AC)-2P.(BC-OC)$

$=P.OC+P.AC-2P.BC+2P.OC$

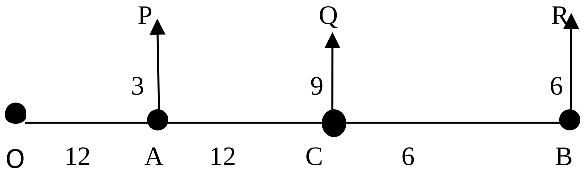
$=P.OC+P.CA-2P.\frac{1}{2}AC+2P.OC$

= 3P.OC

=R.OC

=Moment of R about O

Example:1



Algebraic sum of the moment

about O = P.OA+Q.OB

$=3\times 12+6\times 30$

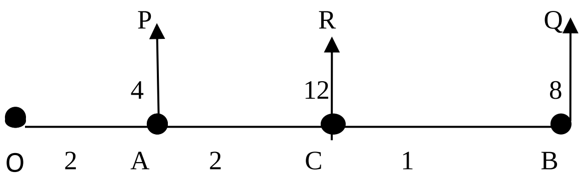
= 36+180

= 216

$=9\times 24$

= Moment of R about O

Example :2



Algebraic sum of the moment

about O = P.OA+Q.OB

$=4\times 2+8\times 5$

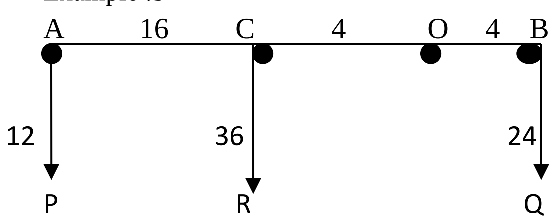
= 8+40

= 48

$=12\times 4$

= Moment of R about O

Example :3



Algebraic sum of the moment

about O = P.OA-Q.OB

$=12\times 20-24\times 8$

= 240-96

= 144

$=36\times 4$

= Moment of R about O

CONCLUSION

In this paper I have prove Varignon's theorem in the concept of edhe labeling Then I explained this concept through some examples.

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