

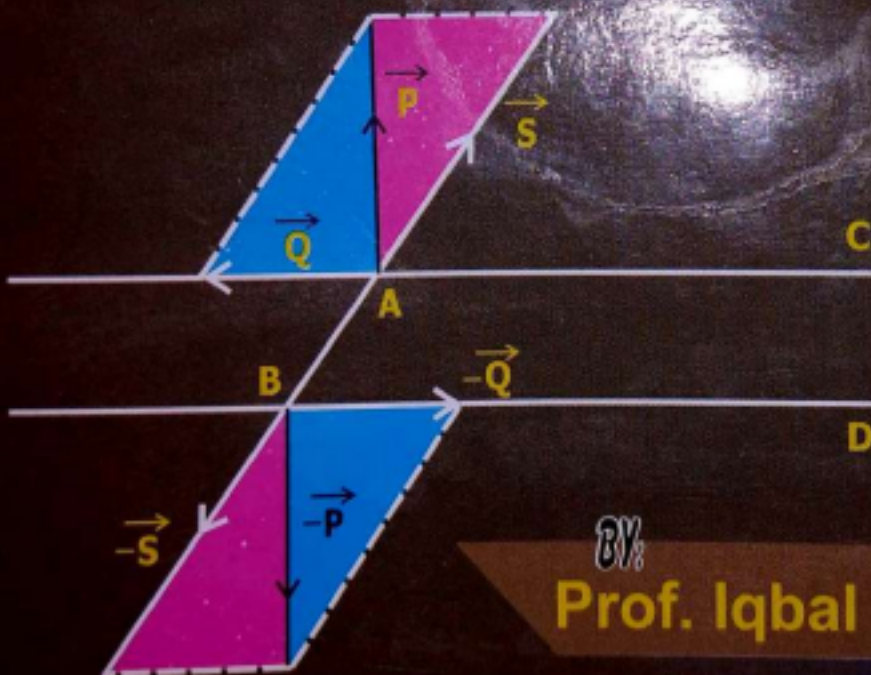
Advance

New Edition

# MECHANICS

for

B.Sc & B.S (Hons.)



BY  
Prof. Iqbal Haider Bhatti

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*Notes of*  
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میتھ (بی ایس سی)

اے کورس، بی کورس، جنرل کورس

کے 7 سالہ پرچہ جات

عارف سنز کی کتاب

**Vector Analysis**

کے ساتھ مفت حاصل کریں۔

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## CHAPTER

## 1

COMPOSITION  
OF FORCES**MECHANICS:**

The Science of force and motion is called mechanics. OR

The study of force and their effects on objects is called mechanics. It has two main branches

(i) Statics (ii) Dynamics

(i) **STATICS:** It is the branch of mechanics which deals with bodies at rest that remain in Equilibrium under the action of forces.

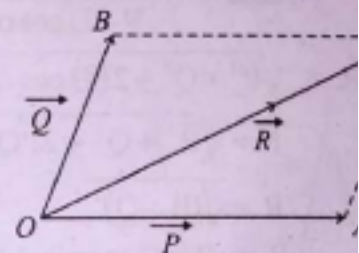
(ii) **DYNAMICS:** It is the branch of mechanics which deals with bodies in motion.

**Components of a Force:**

Let two forces  $\vec{P} = \vec{OA}$  and  $\vec{Q} = \vec{OB}$  are acting at a point O. Now complete a parallelogram OACB. Then by parallelogram law of vector addition their resultant is completely represented in magnitude & direction by the diagonal of parallelogram as shown in fig.

$$\text{Let } \vec{OC} = \vec{R}$$

$$\vec{R} = \vec{P} + \vec{Q}$$



Then  $\vec{P}$  &  $\vec{Q}$  are called components of a force  $\vec{R}$  &  $\vec{R}$  is called as the resultant of  $\vec{P}$  &  $\vec{Q}$ .

**THEOREM:** Find the magnitude of the resultant of two forces  $\vec{P}$  &  $\vec{Q}$  acting at a point O at a certain angle.

**Proof:**

Let two forces  $\vec{P} = \vec{OA}$ ,  $\vec{Q} = \vec{OB}$  are acting at the point O. Let  $\alpha$  is the angle between them.

Now complete a parallelogram OACB then by parallelogram law of vector addition forces  $\vec{R} = \vec{P} + \vec{Q}$

$$\text{Where } \vec{R} = \vec{OC}$$

Now we want to find the magnitude of  $\vec{R}$

For that draw  $CL \perp$  on  $OA$  then from fig, we can see that  $\triangle OLC$  is a right angle triangle by Pythagoras theorem.

$$|\vec{OC}|^2 = |\vec{OL}|^2 + |CL|^2$$

$$|\vec{OC}|^2 = (|\vec{OA}| + |\vec{AL}|)^2 + |\vec{CL}|^2 \dots\dots\dots(1)$$

$$P = |\vec{OA}| \dots\dots\dots(2)$$

$$\text{From } \triangle ALC, \frac{|\vec{AL}|}{|\vec{AC}|} = \cos \alpha \quad \text{But } |\vec{AC}| = Q$$

$$|\vec{AL}| = Q \cos \alpha \dots\dots\dots(3)$$

