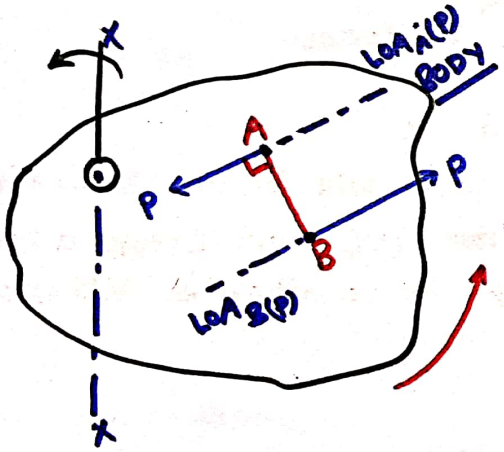
COUPLE: (B.T.E.U.P. 2003, 04, 05, 06, 07, 08, 13)

Concept :- Two equal and opposite forces acting on a body whose lines of action are diffrent, creates a couple.

Arm of couple :- Min. distance between line of action of couple of forces, called arm of couple. (AB)



Moment of couple :-

Is the product of single force of couple and the arm of couple.

$$\left\{\begin{matrix}\text{Moment of} \\ \text{Couple}\end{matrix} = P \times AB\right\} \text{ (N-m)}$$

↳ Represented by M.

Direction and Sign Convention of Couple :-

↺ ACW → (+)ve ; ↻ CW → (−)ve

UNITS OF COUPLE :-

gm-cm , Kg-cm , Kg-m , SI → N-m

Properties of Couple :-

(i) Moment of Couple / Couple Can't generate Translatory motion.

(ii) Can generate only rotational moment.

(iii) Is vector quantity.

(iv) Algebraic sum of both moments of forces is equal to moment of Couple. (Theorem - 1)

(v) Two Co-planar Couple acting on a body whose moment are equal and opposite, balance to each other.

(vi) Resultant of many couples in a same plane is also a couple, whose moment is algebraic sum of a moment of couples. (Theorem-2)

(vii) A unit force and unit couple in a same plane can be reduct in single force.

System of parallel forces :-

3- or More than 3- forces acting on a body will be -

(i) Equilibrant to single force.

(ii) Equilibrant to single couple of force.

(iii) In equilibrium.

If.

① $\Sigma F \neq 0$ then they will be equal to a single force, whose value is sum of all the forces.

② $\Sigma F = 0$

Then force will be in equilibrium either (or) will create a couple but the condition is $\Sigma M \neq 0$.