TOPIC 5 Turning Effect of Forces

Objectives

Candidates should be able to:

(a) describe the moment of a force in terms of its turning effect and relate this to everyday examples
(b) recall and apply the relationship *moment of a force (or torque) = force × perpendicular distance from the pivot* to new situations or to solve related problems
(c) state the principle of moments for a body in equilibrium
(d) apply the principle of moments to new situations or to solve related problems
(e) show understanding that the weight of a body may be taken as acting at a single point known as its centre of gravity
(f) describe qualitatively the effect of the position of the centre of gravity on the stability of objects

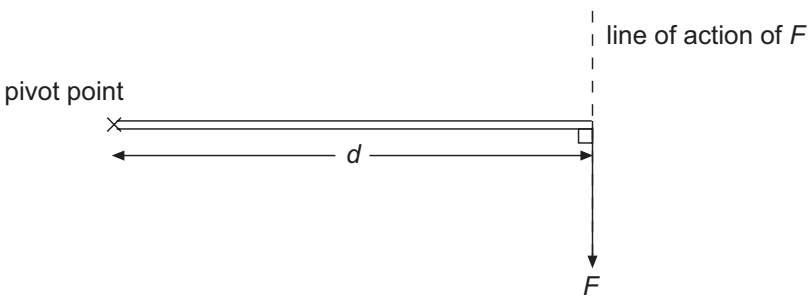
NOTES.....

5.1 Moment of a Force

1. Moment – the turning effect of a force about a pivoting point
2. Moment of force = $F \times d$

   F: Force

   d: perpendicular distance of line of action of F from pivot



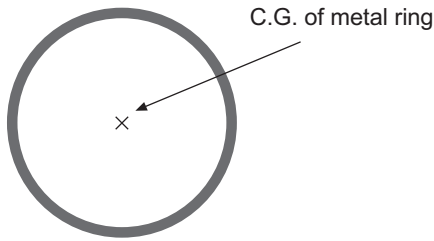
3. SI unit of moment: N m

4. Conditions for object to be in equilibrium:
   (1) The sum of moments about any point is zero. (Principle of Moments)
   (2) The vector sum of forces on object is zero.

5. Principle of Moments:
   For an object in equilibrium, the sum of clockwise moments about any point is equal to the sum of anticlockwise moments about the same point.
   (Resultant moment = 0 N m)

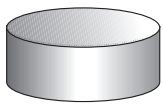
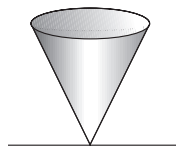
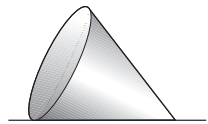
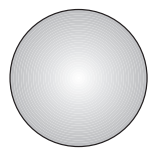
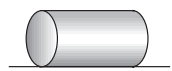
5.2 Centre of Gravity (C.G.)

1. The C.G. of an object is the point where the whole weight appears to act on.
2. The C.G. will not change regardless of how the object is orientated.
3. The C.G. can lie outside an object.
   E.g. C.G. of a metal ring is in the middle of the circle.



5.3 Stability

1. Stability – the ability of an object to retain its original position after being displaced slightly.

	Stable	Unstable	Neutral
Base Area	Large	Small	1 line of contact or point(s) of contact with surface
Height of C.G.	Low	High	–
Slight displacement from equilibrium position	Return to original position	Topple over	Stay in new position
Example	 Cone resting on its base  Cylindrical shape, resting on its base (large base)	 Cone at its vertex  Cylindrical shape, resting on its base (small base)	 Cone resting on its side  Sphere  Cylinder resting on its side

2. The stability of an object can be improved by:
   (a) Lowering its C.G. (Add weights to the object's lower part).
   (b) Increasing the base area of the object.