

Board –ICSE

Class –10th

Topic – Machine

1. Derive the relationship between MA and VR for a machine.
2. Under what conditions a machine is regarded as a Force Multiplier and under what conditions as a speed multiplier.
3. A block of mass 300kg falling at 160m in 2s is used to lift a load of 900kgf. If the load rises up by 40m in same time then calculate
 - (i) MA
 - (ii) VR
 - (iii) WO in 1s
 - (iv) WI in 2s
 - (v) $\% \eta$Is this machine a Force Multiplier or a Speed Multiplier?
4. A crow bar has a length of 130 cm. A load of 50 kgf is placed at one end, which is 30 cm away from the fulcrum. Calculate the effort required.
5. How does one increase the MA of a class II and class III levers?
6. Which class of lever can be a force multiplier or a speed multiplier? Give examples.
7. For a single fixed pulley, an effort of 400N is required for a load of 300N. If the effort is moved by 30cm then calculate the efficiency of the pulley & energy that is used in overcoming friction.
8. A block of mass 250kg falling at the rate of 10m in 5s is used to lift a load of 5000N by 2m in the same time. Calculate
 - (i) VR
 - (ii) MA
 - (iii) PO
 - (iv) WO
 - (v) WI
 - (vi) energy dissipated &
 - (vii) $\%$ efficiency of the system.
9. A truck driver can load oil drums into the back of the truck by pushing them up a sloping plank or by lifting them directly. Each drum has a mass of 80 kg, the plank is 3m long and the back of the truck is 0.8m above the ground

- (a) how much force would be needed to lift a drum into the truck directly, without using the plank?(take $g = 10\text{m/s}^2$)
 - (b) assuming that there is no friction between the plank and the drum, calculate
 - (i) the MA of the inclined plank,
 - (ii) the force needed to push a drum up the plank.
10. Justify the following statements: “An inclined plane should not be very steep”.
11. An inclined plane is of length 8m & its vertical height is 4m. Calculate the effort required for a load of 200kgf if i) plane is ideal & ii) plane is 75% efficient.
Also calculate the angle of inclination of the plane
12. Write a relationship between Number of teeth, Radius and Number of Revolutions of a 2 gear system.
13. Explain the use of a Gear System for gaining Torque and gaining Speed.
14. What should the Gear Ratio be for a Gear System being used as a Force Multiplier?