WORKSHOP CALCULATION AND SCIENCE-UNIT 9: LEVERS AND SIMPLE MACHINES

SEMESTER – II

1. What is the ratio between the distances moved by the effort to the distance moved by the road?
   a) Mechanical advantage   b) velocity ratio   c)efficiency   d) fulcrum
   Ans: **velocity ratio**

2. What is the ratio of mechanical advantage to the velocity ratio of a simple machine?
   a) Load   b) effort   c) efficiency   d) power
   Ans: **efficiency**

3. What is the mechanical advantage, if a load of 1000kg is lifted by a simple machine and effort applied is 250kg?
   a) 6   b) 8   c) 3   d) 4
   Ans: Mechanical advantage = $\frac{LOAD\ (W)}{EFFORT\ (P)} = \frac{1000}{250} = $ **4**

4. What is the velocity ratio of a wheel and axle if the radii of wheel and axle are 375 mm and 75 mm respectively?
   a) 3   b) 4   c) 5   d) 6
   Ans: In wheel and axle, the effort is applied through wheel, and the load acts through axle
   Velocity Ratio = $\frac{Distance\ moved\ by\ Effort}{Distance\ moved\ by\ Load} = \frac{dp}{dw} = \frac{375}{75} = $ **5**

5. What is the velocity ratio of a simple machine of a mass 120kg is lifted to a height of 5 metres by a force of 60kg moving 15 metre. Calculate velocity ratio?
   a) 1   b) 2   c) 3   d) 4
   Ans: Velocity Ratio = $\frac{Distance\ moved\ by\ Effort}{Distance\ moved\ by\ Load} = \frac{dp}{dw} = \frac{15}{5} = $ **3**

6. What is the efficiency of a simple screw jack having velocity ratio is 314.2 and mechanical advantage is 220?
   a) 60%   b) 65%   c) 70%   d) 75%
   Ans: Efficiency $= \frac{Mechanica\ Advantage}{Velocity\ Ratio}$ x 100%
   $= \frac{220}{314.2}$ x 100% = **70%**

7. How much load is lifted if an effort of 25 kg is applied to a simple machine having velocity ratio of 4 and efficiency 75%? *
   a) 65 kg | 65 kg   b) 70 kg | 70 kg   c) 75 kg | 75 kg   d)80 kg | 80 kg
   Ans: Efficiency η $= \frac{Mechanical\ Advantage}{Velociry\ Ratio}$ x 100%
   Mechanical Advantage   = η x VR
   $= \frac{75}{100}$ x 4 = 3
   Also Mechanical Advantage $= \frac{W}{P}$;
   W   = P x MA = 3 X 25 = **75kg**

8. What is the name of fixed or supporting point of a lever? *
   a) mechanical advantage   b) fulcrum   c) effort   d) load
   Ans: fulcrum

9. What effort required to lift a load of 150 kg in a wheel and axle, if the velocity ratio is 2.5 and the efficiency of the machine is 75%? *

    a) 70 kg   b) 80 kg   c) 90 kg   d) 100 kg

    Ans: Efficiency η $= \dfrac{Mechanical\ Advantage}{Velociry\ Ratio}$ x 100%

    Mechanical Advantage = η x VR

    $= \dfrac{75}{100}$ x 2.5 = 1.875

    Also Mechanical Advantage $= \dfrac{W}{P}$;

    P $= \dfrac{W}{MA} = \dfrac{150}{1.875}$ = **80kg**

10. What is the distance of the load from the fulcrum called? *

    a) effort arm   b) load arm   c) lower arm   d) effort

    Ans: load arm

11. Which is example for first order lever? *

    a) wheel barrow   b) pair of scissors   c) fire tongs   d) lime squeezer

    Ans: pair of scissors

12. Which is example for second order lever?

    a) common balance   b) a pair of scissors   c) bottle opener   d) human forearm

    Ans: bottle opener

13. Which is example for third order lever? *

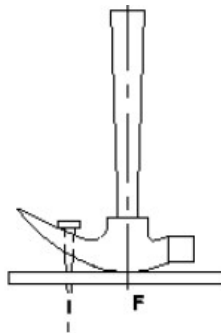   a) common balance   b) forceps   c) a pair of scissors   d) lime squeezer

    Ans: forceps

14. Which type of levers is bell cranked lever? *

    a) curved lever   b) 1st order lever   c) 2nd order lever   d) 3rd order lever

    Ans: curved lever
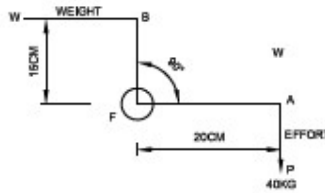
15. Which order lever is claw hammer? *

    a) 1st order lever   b) 2nd order lever   c) 3rd order lever   d) curved lever

    Ans: 1st order lever

16. In the figure given below in bell cranked lever AFB, on perpendicular AF the force P is 40 kg. Weight W is on perpendicular FB. Find the measure of W?

   a) 52.5 kg   b) 53.3 kg   c) 33.3 kg   d) 80.5 kg

     Ans: By principle of momentum

           P x AF = W x BF

           40x20 = W x 15

           W = 53.3 kg

17. Calculate efficiency of the machine, if the effort applied is 250 kg and a load of 1000 kg is lifted by a simple machine having a velocity ratio 5. *

   a) 50%   b) 75%   c) 80%   d) 100%

     Ans: Mechanical Advantage $= \frac{W}{P} = \frac{1000}{250} = 4$

           Efficiency η $= \frac{Mechanical\ Advantage}{Velociry\ Ratio}$ x 100% $= \frac{4}{5}$ x 100% = **80%**

18. Calculate the applied force if a Load of 400 kg is lifted by a machine having and efficiency of 72% and velocity ratio = 6?

   a) 100 kg   b) 95.52 kg   c) 94 kg   d) 92.59kg

   Ans: Efficiency η $= \frac{Mechanical\ Advantage}{Velociry\ Ratio}$ x 100%

             72     $= \frac{Mechanical\ Advantage}{6}$ x 100%

     Mechanical Advantage = 4.32

           MA $= \frac{W}{P}$;

          4.32 $= \frac{400}{P}$

         P   = **92.59 kg**