$$F = \frac{1000 \times g}{20} \times \left(\frac{18}{64 \times 5}\right)^2 \times \left(48 \times \frac{5}{18}\right)^2 + \frac{1000 \times g}{20}$$

$$= \frac{1000 \times 9.8}{20}\left[\frac{9}{16} - 1\right] = \frac{50 \times 9.8 \times 25}{16} = 765.6 \text{ N}$$

Power developed = Force × Velocity

= 765.6 × 48 × 5/18 = 10208 W = **10.2 kW**

Practice Problems # 3

1. A lift is designed to carry a load of 400 kg through 10 floors of a building averaging 6 m per hour in 10 seconds. The horse power of the lift is

(A) 300.15 H.P. (B) 315.28 H.P (C) 328.23 H.P. (D) None of these

2. A car of mass 1000 kg accelerates uniformly from rest to velocity of 54 km/h in 5 second. The average power of the engine during this period (Neglect friction) is

(A) 20000 W (B) 22500 W (C) 3000 W (D) 5000 W

3. A car of mass 2000 kg is lifted up a distance of 30 m by a crane A in 1 min. A second crane B does the same job in 2 min. The ratio of power supplied by the two cranes A and B is

(A) 1 : 2 (B) 2 : 1 (C) 1 : 1 (D) 1 : 4

4. A truck of mass 30,000 kg moves up an inclined plane of slope 1 in 100 at a speed of 30 km/h. The power of the truck is (Given g = 10 ms^{-1})

(A) 25 kW (B) 10 kW (C) 5 kW (D) 2.5 kW

5. A car of mass m is driven with acceleration 'a' along a straight line road against external resistive force R. When the velocity of the car is V, the rate at which the engine of the car is doing work will be

(A) RV (B) maV (C) (R+ m) V (D) (ma –R) V

6. The average power required to lift a 100 kg man through a height of 50 metres in approximately 50 seconds would be

(A) 50 J/s (B) 5000 J/s (C) 100 J/s (D) 980 J/s

7. A man of mass 80 kg runs up a staircase in 15 s. Another man M_2 also of mass 80 kg runs up the stair case in 20 s. The ratio of the power developed by them (P_1/P_2) will be

(A) 1 (B) 4/3 (C) 16/9 (D) None of the above

8. An electric motor creates a tension of 4500 N in hoisting cable and runs at the rate of 2 m/s. What is the power of electric motor.

(A) 9W (B) 9 kW (C) 225 W (D) 9000 H.P.

9. A block of mass m is moving with a constant acceleration 'a' on a rough horizontal plane. If the coefficient of friction between the block and plane is μ. The power delivered by the external agent at a time t from the beginning is equal to

(A) ma^2t (B) μmgat (C) μm(a+μg) gt (D) m(a + μg)at

10. A machine gun is firing 60 bullets for minute with a velocity of 700 ms^{-1}. If each bullet has a mass of 50 g, the power developed by the gun is

(A) 20000W (B) 10000 W (C) 12250 W (D) 12000 W

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