CHAPTER 21

1. In the given Fizeau’s apparatus,
   \( C = 12 \text{ km} = 12 \times 10^3 \text{ m} \)
   \( n = 180 \)
   \( c = 3 \times 10^8 \text{ m/s} \)
   
   We know, \( c = \frac{2Dn_0}{\pi} \)
   
   \( \Rightarrow \ \omega = \frac{\pi c}{2Dn} \text{ rad/sec} = \frac{\pi \times 180}{2Dn} \text{ degree/sec} \)
   
   \( \Rightarrow \ \omega = \frac{180 \times 3 \times 10^8}{24 \times 10^3 \times 180} = 1.25 \times 10^4 \text{ degree/sec} \)

2. In the given Focault experiment,
   \( R = \text{Distance between fixed and rotating mirror} = 18 \text{ m} \)
   \( \omega = \text{Angular speed} = 355 \text{ rev/} = 355 \times 2\pi \text{ rad/sec} \)
   \( b = \text{Distance between lens and rotating mirror} = 6 \text{ m} \)
   \( a = \text{Distance between source and lens} = 2 \text{ m} \)
   \( s = \text{shift in image} = 0.7 \text{ cm} = 0.7 \times 10^{-3} \text{ m} \)
   
   So, speed of light is given by,
   \( C = \frac{4R^2 \omega}{a} = \frac{4 \times 16^2 \times 355 \times 2\pi \times 2}{0.7 \times 10^{-3} (16 + 6)} = 2.975 \times 10^8 \text{ m/s} \)

3. In the given Michelson experiment,
   \( C = 4.8 \text{ km} = 4.8 \times 10^3 \text{ m} \)
   \( N = 8 \)
   
   We know, \( c = \frac{DnN}{2\pi} \)
   
   \( \Rightarrow \ \omega = \frac{2\pi c}{DN} \text{ rad/sec} = \frac{c}{DN} \text{ rev/sec} = \frac{3 \times 10^8}{4.8 \times 10^3 \times 8} = 7.8 \times 10^5 \text{ rev/sec} \)