SOLUTIONS TO CONCEPTS
CHAPTER 21

1. In the given Fizeau'' apparatus,
   $D = 12$ km $= 12 \times 10^3$ m
   $n = 180$
   $c = 3 \times 10^8$ m/sec
   We know, $c = \frac{2Dn\omega}{\pi}$
   $\Rightarrow \omega = \frac{\pi c}{2Dn}$ rad/sec $= \frac{\pi c}{2Dn} \times \frac{180}{\pi}$ deg/sec
   $\Rightarrow \omega = \frac{180 \times 3 \times 10^8}{24 \times 10^3 \times 180}$ $= 1.25 \times 10^4$ deg/sec
2. In the given Focault experiment,
   R = Distance between fixed and rotating mirror = 16m
   ω = Angular speed = 356 rev/′ = 356 × 2π rad/sec
   b = Distance between lens and rotating mirror = 6m
   a = Distance between source and lens = 2m
   s = shift in image = 0.7 cm = 0.7×10^{-3} m
   So, speed of light is given by,
   $C = \frac{4R^2\omega a}{s(R+b)} = \frac{4 \times 16^2 \times 356 \times 2\pi \times 2}{0.7 \times 10^{-3}(16+6)}$ $= 2.975 \times 10^8$ m/s
3. In the given Michelson experiment,
   $D = 4.8$ km $= 4.8 \times 10^3$ m
   $N = 8$
   We know, $c = \frac{D\omega N}{2\pi}$
   $\Rightarrow \omega = \frac{2\pi c}{DN}$ rad/sec $= \frac{c}{DN}$ rev/sec $= \frac{3 \times 10^8}{4.8 \times 10^3 \times 8}$ $= 7.8 \times 10^3$ rev/sec

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