Answer on Question #64087, Physics / Mechanics | Relativity

7. An 80-kg man and his car are suddenly accelerated from rest to a speed of 5 m/s as a result of a rear-end collision. Assuming the time taken to be 0.3s, find:
a) the impulse on the man and
b) the average force exerted on him by the back seat of his car.

Solution:

a) $p = mv = 80\ kg \times 5\ m/s = 400\ kg\ m/s$

b) $F = p/t = 400\ kg\ m/s / 0.3\ s = 1333\ N$

Answer: a) 400 kg m/s; b) 1333 N

8. An airplane propeller is rotating at 1900 rev/min.
a. Compute the propeller's angular velocity in rad/s.
b. How long in seconds does it take for the propeller to turn through 30.0 degrees?

Solution:

a) $\omega = 2\pi f = 2 \times 3.14 \times (1900\ rev/min / 60) = 198.8\ rad/s$

b) $\phi = \omega t$; $t = \phi/\omega = 30^0 \times \pi / 180^0 \times 198.8\ rad/s = 0.0025\ s$

Answer: a) 198.8 rad/s; b) 0.0025 s

9. A disk with a 1.0-m radius reaches a maximum angular speed of 18 rad/s before it stops 30 revolutions after attaining the maximum speed. How long did it take the disk to stop?

Solution:

$t = d/v$

$v = \omega R$

$d = 2\pi Rn$

$t = 2\pi Rn / \omega R = 2 \times 3.14 \times 30 / 18\ rad/s = 10.5\ s$

Answer: 10.5 s