Branch: Makro
Course: Physics
Teaching form: Classes
Semester: 2
Academic Year: 2018/2019

PRACTICE PROBLEMS - SET 1

KINEMATICS AND DYNAMICS OF MATERIAL POINT

Problem #1.
A driver is approaching a stoplight moving with a speed (velocity) υ *= +30 m/s.* The light turns yellow, and driver applies the brakes and skids to a stop. If the acceleration $a = -8\ m/s^2$, determine the displacement of car during the skidding process.

Problem #2.
The brakes on your automobile are capable of creating a maximum deceleration $a = 5.2\ m/s^2$. You are going at a velocity υ = 120 km/h within a city area and suddenly see a policeman with radar. What is the minimum time in which you can get your car under the speed limit? What distance is covered during the braking? Will the radar detect your speeding?

Problem #3.
A certain plane has a velocity $\upsilon = 290\ km/h$ and is diving at an angle $\alpha = 30°$ below the horizontal when the pilot releases a radar decoy. The horizontal distance between the release point and the point where the decoy strikes the ground is $d = 700\ m$. How long is the decoy in the air? How high was the released point? What is the decoy velocity just above the ground?

Problem #4.
You pull a sledge of mass $m = 5\ kg$ with a child of mass $m = 15\ kg$ with a force exerted at the angle α = 30° above the horizontal. The friction coefficients f between the child and sledge and between the sledge and ground are *0.6* and *0.1*, respectively What is the magnitude of the force you exert if the sledge slides with constant velocity, and when slides with such an acceleration that the child starts to slip off the sledge?

Problem #5.
A flatbed truck slowly tilts its bed upward to dispose of crate of mass $m = 95\ kg$. For small angles of tilt the crate stays put, but when the tilt angles α exceeds 23,2° the crate begins to slide. What is the coefficient of static friction between the bed of the truck and the crate?

Problem #6.
A car of mass $m = 1200\ kg$ rounds a corner of radius $r = 45\ m$. If the coefficient of static friction between the tires and the road f = 0.85, what is the greatest speed the car can have in the corner without skidding?

Problem #7.
A baseball is hit so that it leaves the bat making an angle $\alpha = 30°$ with the ground. It crosses a low fence at the boundary of the ballpark at distance $d = 100\ m$ from home plate at the same height that it was struck. Neglecting the air resistance calculate what was its velocity as it left the bat?

Problem #8.
A pitcher throws a baseball of mass $m = 0.15\ kg$ accelerating it from rest to velocity $\upsilon = 60\ km/h$. Estimate the force exerted by the pitcher on the ball. If needed, make a reasonable assumption for the distance over which the pitcher accelerates the ball.

Problem #9.
A ladder of length $l = 8.6\ m$ long and mass $m = 60\ kg$ is placed in nearly vertical position against the wall of a building. You stand on a rung with your center of mass at the top of ladder. As you lean back slightly, the ladder begins to rotate about its base away from the wall. Is it better to quickly step off the ladder and drop to the ground or to hold onto the ladder and step off just before the top end hits the ground? In calculations take your mass.

in some problems some additional assumption based on the general knowledge may be necessary