**SEMINAR 1**

**1.** A man travels for 3.6 km with 3km/h, then 2.9 km in 66 min, and at the end, walks for 42min with 4km/h in the same direction. Find the man's average speed.

**2.** A man travels for 4,8km with 4km/h, then 1,5 km in 33min, and at the end, walks for 45min with 3,6km/h in the same direction. Find the man's average speed.

**3.** A small body is freely released from a platform located 180 meters above the ground. If $g=10m/s^2$ and we ignore air resistance find a) the time required to reach the ground b) the velocity at the ground c) the velocity at 55 m from the ground d) the distance traveled in the last 2 seconds of flight.

**4.** A small body is freely released from a platform located 605 meters above the ground. If $g=10m/s^2$ and we ignore air resistance find: a) the time required to reach the ground; b) the velocity at the ground; c) the velocity at 425 m from the ground; d) the distance traveled in the firstt 4 seconds of flight; e) the distance traveled in the last 4 seconds of flight; f) the distance traveled in the third second of flight and in the seventh.

**5.** A body is thrown vertically upward from the Earth ground with 10m/s. Neglecting air friction and considering $g=10m/s^2$ find: a) the maximum height of the body ; b) total time of flight; c) moments when the body has ¼ from its initial velocity.

**6.** A ball is shot directly upward from the ground with an initial speed of $v_0=7m/s$. Simultaneously, an elevator cab begins to move upward from the ground with a constant speed of $v_c$ =3m/s.What maximum height does the ball reach (a) relative to the ground and (b) relative to the cab floor? At what rate does the speed of the ball change (c) relative to the ground and (d) relative to the cab floor?

**7.** The law of motion for a mass point is: $\vec{r} = 2\,\vec{\imath} + (1+3t)\vec{\jmath} + (4t-5t^2)\vec{k}$ (m). Write
a) initial position (at t=0) b) the velocity law; initial velocity and speed (at t=0);
c) the expression of the acceleration and its magnitude
d) the time variable angle θ(t) between the velocity and the acceleration; particular case t=0;
e) describe the motion.

**8.** The movement of a body with mass 100g in the xOy plane is described by the law:
$x = 2 - 4t$ (m), $y = 2 - 5t^2$ (m).. Find
a) the angle between velocity and acceleration for the mass point;
b) the force acting upon the mass point;
c) the trajectory equation of the mass point; make the graph.

**9.** The law of motion for a mass point is:
$x(t) = 5\cdot\sin(3t)$ (mm) $y(t) = 5\cdot\cos(3t)$ (mm) $z(t)=4t$ (mm)
Find the velocity and acceleration for the mass point and describe the motion.

**10.** The law of motion for a mass point with m=100kg is:
$x(t) = 5\cdot\sin(3t)$ (mm)
$y(t) = 6\cdot\cos(3t)$ (mm)
Write the force like a function of position vector. Describe the trajectory.

**11.** The movement of a body in the xOy plane is described by the law:
$x = 2\sin 5t$ (m), $y = 2(1 - \cos 5t)$ (m). Find
a) the angle between velocity and acceleration for the mass point;
b) the force acting upon the mass point (m=40kg) (eventually like a function of position vector and constant vectors);
c) the trajectory equation of the mass point; make the graph.

**12.** The movement of a body in the xOy plane is described by the law: $x = \beta t$ (m), $y = \alpha t(1 - \beta t)$ (m), where $\alpha, \beta$ are positive constants (particular case $\alpha=4, \beta=2$). Find:
a) the trajectory equation of the mass point; make the graph:
b) the velocity, the speed, the acceleration;
c) the moment $t_0$ when the angle θ(t) between the velocity and the acceleration is π/4.