



## Classical Mechanics Test - July 2016 - Version 1Engl

Consider the gravitational acceleration  $g = 10\text{m/s}^2$

Each item is scored 7.5 points and ex officio 10 points.

1. Knowing that physical quantities and units of measurement are those used in physics textbooks, the SI unit of measurement for power is:

- a)  $\text{Nms}^{-2}$                       b)  $\text{kgms}^{-2}$                       c)  $\text{kwh}$                       d)  $\text{W}$

2. The notations being those used in physics textbooks, the modulus of the sliding friction force is:

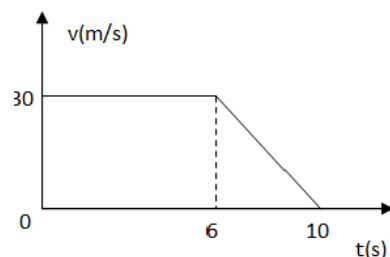
- a)  $F_f = \mu N$                       b)  $F_f = N/\mu$                       c)  $F_f = \mu^2 N$                       d)  $F_f = \mu N^2$

3. Two identical steel rods are under stress in such way that the ratio of the relative elongation is 4. The ratio of the stress in rods is:

- a) 6                      b) 4                      c) 2                      d) 8

4. The modulus of the velocity of a mass point in rectilinear moving is shown in the figure. The average acceleration during time  $t \in [0; 6]\text{s}$  is:

- a)  $10\text{m/s}^2$                       b)  $5\text{m/s}^2$                       c)  $0\text{m/s}^2$                       d)  $2\text{m/s}^2$



5. A body slides without friction along an inclined plane. The acceleration of the body depends on:

- a) the angle of the inclined plane;                      b) the length of the inclined plane;  
c) the initial speed of the body;                      d) the weight of the body

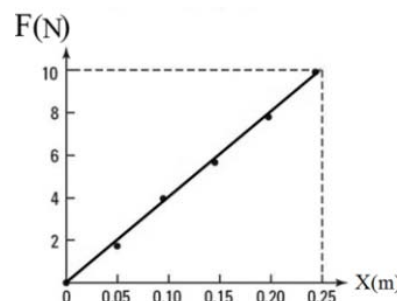
6. A body with mass  $m = 1\text{kg}$  placed on a horizontal plane is under the effect of the horizontal force  $F=10\text{N}$  that gives it the acceleration  $a=4\text{m/s}^2$ . The coefficient of the sliding friction has the value:

- a)  $\mu = 0,6$                       b)  $\mu = 0,4$                       c)  $\mu = 0,2$                       d)  $\mu = 0,1$

7. A ball with mass  $m_1 = 4\text{kg}$  suspended on an inextensible string is lifted with the acceleration "a". Afterward, another ball with mass  $m_2 = 6\text{kg}$ , suspended on the same string, descends with the same acceleration "a" (in modulus), the tension in the string being the same. Find the acceleration "a":

- a)  $a=10\text{ m/s}^2$                       b)  $a=5\text{ m/s}^2$                       c)  $a=2\text{ m/s}^2$                       d)  $a=4\text{ m/s}^2$

8. In the graph below, it is represented the dependence between the force and elongation for an elastic string. Which of the following statements describes the relationship between the force and the deformation of the spring?



- a) The line in the graph would be the same for any type of spring.
- b) If we replace the spring with another having a bigger elastic constant, the line will bend up.
- c) If the spring would be compressed instead of being extended, the graph would not be a straight line.
- d) The slope of the line is the elasticity constant of the spring.

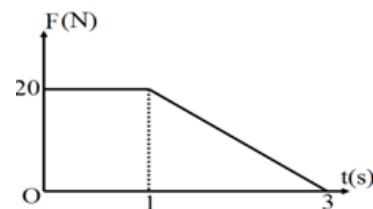
9. We consider an experiment prepared by two athletes, a girl and a boy, both rollers. They have equal masses and stay face to face. Girl keeps hands on the boy's shoulders and push hard. Regarding the experiment performed, which of the following statements is true?

- a) The two athletes move away one from each other with equal speed.
- b) The two athletes begin to move together with the same speed.
- c) The two athletes move away one from each other, the girl having the speed double than the speed of the boy.
- d) The two athletes move away one from each other, the girl having the speed half of the speed of the boy.

10. Consider a cube made on wood, which is given an initial velocity  $\vec{v}_0$  from the base of an inclined plane. The plane has the angle  $\alpha$  with the horizontal. Find the acceleration of the cube on the climbing on the inclined plane.

- a)  $a_u = 0$
- b)  $a_u = -g(\sin \alpha + \mu \cos \alpha)$
- c)  $a_u = g(\sin \alpha + \mu \cos \alpha)$
- d)  $a_u = g$

11. A force depending on time according to the graph below, acts on a body of mass  $m = 2\text{kg}$  which is initially at rest. What value will have the velocity of the body after a time interval of 3s?



- a)  $v = 10 \text{ m/s}$
- b)  $v = 30 \text{ m/s}$
- c)  $v = 20 \text{ m/s}$
- d)  $v = 0 \text{ m/s}$

12. A motorized sled climbs an access ramp having angle  $\alpha = 30^\circ$  with a uniform accelerated movement with acceleration  $a = 0.5\text{m/s}$ . The sliding friction coefficient is  $\mu = 0.2$ . Calculate the efficiency of the movement of the sled on the access ramp.

- a) 54%
- b) 76%
- c) 27%
- d) 90%