YTU Physics Department, 2018-2019 Fall Semester		Exam Date: 2018	Exam Duration min.
FIZ1001 Physics-1 Midterm			
Question Sheet	**A A A A A**	The 9th article of Student Disciplinary Regulations of YÖK Law No.2547 states ***"Cheating or helping to cheat or attempt to cheat in exams"*** de facto perpetrators takes **one or two semesters suspension** penalty.	
Name Surname	SAMPLE		
Registration No	SAMPLE		
Physics Group No			
Department	SAMPLE		
Exam Hall	SAMPLE	Students are **NOT** permitted to bring **calculators mobile phones, smart watches** and/or any other **unauthorised electronic devices** into the exam room.	
Lecturer's Name-Surname		**Student Signature**	SAMPLE

$g = 10\ (m/s^2)$ $\pi = 3$

θ	0^0	30^0	37^0	45^0	53^0	60^0	90^0
Sin	0	0.5	0.6	$0.7=\frac{\sqrt{2}}{2}$	0.8	$0.86=\frac{\sqrt{3}}{2}$	1
Cos	1	$0.86=\frac{\sqrt{3}}{2}$	0.8	$0.7=\frac{\sqrt{2}}{2}$	0.6	0.5	0

$$\vec{v}_{ort}=\frac{\overrightarrow{\Delta r}}{\Delta t};\ \vec{v}=\frac{\overrightarrow{dr}}{dt};\ \vec{a}_{ort}=\frac{\overrightarrow{\Delta v}}{\Delta t};\ \vec{a}=\frac{\overrightarrow{dv}}{dt}\ a_t=\frac{dv}{dt};a_r=\frac{v^2}{r}$$

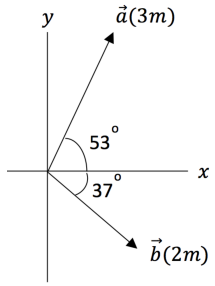
$$a=sabit\ \Rightarrow\ v=v_0+at\ ;\ x=x_0+v_0t+\frac{1}{2}at^2$$

$$\sum\vec{F}=m\vec{a}\ ;\ f_k=\mu_kN\ ;\ f_s\le\mu_sN\ ;\ \ W=\int\vec{F}.\overrightarrow{dl}\ \ ;K=\frac{1}{2}\ mv^2$$

$$W_T=\Delta K\ ;\ U=mgy\ ;\ \ U=\frac{1}{2}kx^2$$

Questions 1-3

Perform the below operation by using two vectors $(a=3(m), b=2(m))$shown in figure.



1) $\vec{a}-\vec{b}=?$

a) $3.4\hat{\imath}+3.6\hat{\jmath}$ **b)** $0.2\hat{\imath}+1.2\hat{\jmath}$ **c)** $-0.2\hat{\imath}+1.2\hat{\jmath}$ **d)** $-0.2\hat{\imath}+3.6\hat{\jmath}$ **e)** $0.2\hat{\imath}+3.6\hat{\jmath}$

2) $\vec{a}\cdot\vec{b}=?$

a) $2.88\hat{\imath}-2.88\hat{\jmath}$ **b)** 0 **c)** 1 **d)** $-2.58\hat{\imath}+2.58\hat{\jmath}$ **e)** 2

3) $\vec{a}\mathrm{x}\vec{b}=?$

a) $6\hat{k}$ **b)** $-6\hat{k}$ **c)** -6 **d)** $-2.16\hat{k}$ **e)** $2.16\hat{k}$

Questions 4-6

A car is stopped at the traffic light. Then, it travels a long straight road so that its distance from the light is given by $x(t)=bt^2-ct^3$, where $b=2.40m/s^2$and $c=0.120m/s^3$.

4) Calculate the average velocity of the car between $t=0$ and $t=10s$.

a) $10\ (m/s)$ **b)** $240\ (m/s)$ **c)** $12\ (m/s)$ **d)** $24\ (m/s)$ **e)** $120\ (m/s)$

5) Calculate the instantaneous velocity of the car at $t=5s$.

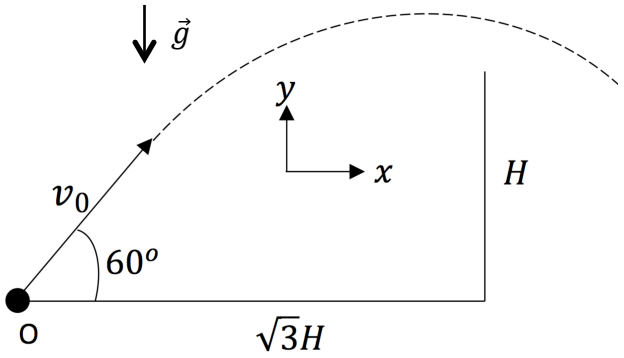
a) $30\ (m/s)$ **b)** $24\ (m/s)$ **c)** $16\ (m/s)$ **d)** $15\ (m/s)$ **e)** $9\ (m/s)$

6) How long after starting from the rest is the car again in rest?

a) $\frac{40}{3}\ (s)$ **b)** $\frac{4}{3}\ (s)$ **c)** $\frac{3}{4}\ (s)$ **d)** $\frac{4}{13}\ (s)$ **e)** $\frac{1}{3}\ (s)$

Questions 7-9

An object is projected at an initial speed v_0 at an angle 60^o with respect to the horizontal toward a wall of height H which is a distance $\sqrt{3}H$ away initially.



7) Your job is to make sure that initial speed is big enough so that the projectile goes over the top of the wall. Which of the following is the ***minimum*** speed such that it does?

a) $\sqrt{2H}$ **b)** $\sqrt{10H}$ **c)** $3\sqrt{10H}$ **d)** $\sqrt{30H}$ **e)** $\sqrt{3H}$

8) How long does it take the projectile to reach the top of the wall?

a) $\sqrt{\frac{H}{30}}$ **b)** $2\sqrt{\frac{H}{30}}$ **c)** $4\sqrt{\frac{H}{10}}$ **d)** $\sqrt{\frac{H}{10}}$ **e)** $2\sqrt{\frac{H}{10}}$

9) What is the tangential and radial components of the acceleration when it hits the ground?

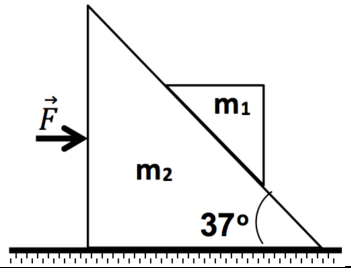
a) $a_t = \sqrt{3}\ (m/s^2)$ $a_r = \sqrt{3}(m/s^2)$ **b)** $a_t = -\sqrt{3}(m/s^2)$ $a_r = \sqrt{3}(m/s^2)$ **c)** $a_t = 5\sqrt{3}(m/s^2)$ $a_r = 5\sqrt{3}(m/s^2)$ **d)** $a_t = 5\sqrt{3}(m/s^2)$ $a_r = 5(m/s^2)$ **e)** $a_t = \sqrt{3}(m/s^2)$ $a_r = 5\sqrt{3}(m/s^2)$

----------USE FOR SCRATCH WORK----------

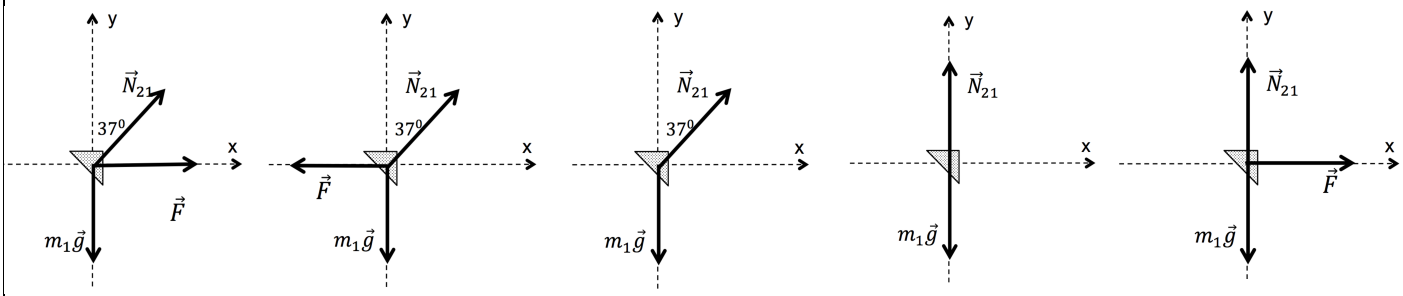
Questions 10-13

In the system of triangle shaped blocks illustrated in the figures, a constant external force $\vec{F}$ is applied in such a way that m_1 stays stationary relative to m_2. The whole system is frictionless.

Here, $m_1 = 2.4$ kg, $m_2 = 4.0$ kg



10) Which of the following is the free body diagrams for the mass m_1 relative to a stationary observer on the ground (inertial observer)?



a) **b)** **c)** **d)** **e)**

11) Which of the following is the correct the equations of motion of the masses m_1 and m_2 box for a stationary observer on the ground (inertial observer).

a) $0.6\,N_{21} = m_1a_1$, $F - f_k = m_2a_2$ **b)** $0.6N_{21} = m_1a_1$, $F - 0.6N_{12} = m_2a_2$ **c)** $F - 0.6N_{21} = 0$, $F - 0.6N_{12} = m_2a_2$ **d)** $F - 0.6N_{21} = 0$, $0.6N_{12} = m_2a_2$ **e)** $F - 0.6N_{21} = m_1a_1$, $F - 0.6N_{21} = m_2a_2$

12) What is the accelerations of the masses.

a) $30\ (m/s^2)$ **b)** $15\ (m/s^2)$ **c)** $10\ (m/s^2)$ **d)** $7.5\ (m/s^2)$ **e)** $12\ (m/s^2)$

13) Which of the followings is the magnitude of the force $\vec{F}$

a) $40\ (N)$ **b)** $20\ (N)$ **c)** $28\ (N)$ **d)** $30\ (N)$ **e)** $48\ (N)$

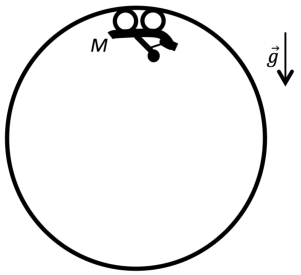
Questions 14

A disk-shaped space station of $50\ (m)$ in radius spins uniformly about the plane of the disk through its center. What must be the angular speed of the disk ($\omega = v/r$) so that the acceleration of all points on its rim is half of the gravitational acceleration $\frac{g}{2}$?

a) $0.1\ (\frac{\text{rad}}{\text{s}})$ **b)** $0.01\ (\frac{\text{rad}}{\text{s}})$ **c)** $0.001\ (\frac{\text{rad}}{\text{s}})$ **d)** $1\ (\frac{\text{rad}}{\text{s}})$ **e)** $1.1\ (\frac{\text{rad}}{\text{s}})$

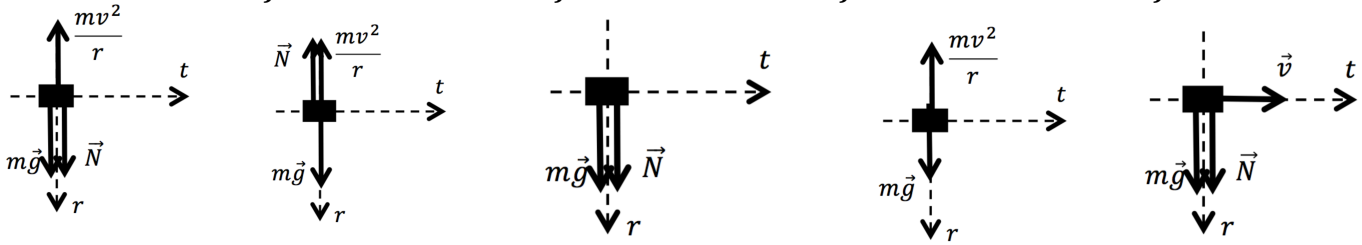
Questions 15-16

A motorcycle of mass M is making uniform circular motion on a circular path on the vertical plane.



15) Which of the following is the correct the free body diagram of the motorcycle at the top relative to a stationary observer on the ground (inertial observer).

a) **b)** **c)** **d)** **e)**



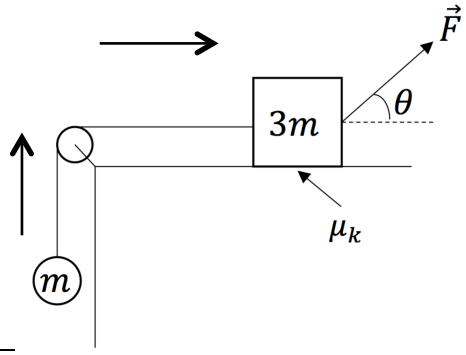
16) If the radius of the circular path is $R = 40\ (m)$, what is the minimum speed of the motorcycle to successfully complete its revolution?

a) $30\ (m/s)$ **b)** $20\ (m/s)$ **c)** $10\ (m/s)$ **d)** $15\ (m/s)$ **e)** $40\ (m/s)$

Questions 17-20

A constant force $\vec{F}$ is applied to the mass of $3m$ at an horizontal angle of θ. Under the action of $\vec{F}$, the system starts its motion from the rest. (The rope and pulley are massless and frictionless)

Here, $m = 10kg, F = 300N, \theta = 37^o, \mu_k = \frac{2}{3}$



17) What is the work done by the force $\vec{F}$ after displacement of $d = 2\ (m)$?

a) $240\ (J)$ **b)** $600\ (J)$ **c)** $480\ (J)$ **d)** $24\ (J)$ **e)** $0\ (J)$

18) What is the work done by the force of friction after displacement of $d = 2(m)$?

a) $-120\ (J)$ **b)** $-240\ (J)$ **c)** $-80\ (J)$ **d)** $0\ (J)$ **e)** $-160(J)$

19) What is the total work done by the weight of masses after displacement of $d = 2(m)$?

a) $800\ (J)$ **b)** $-200\ (J)$ **c)** $600\ (J)$ **d)** $-800\ (J)$ **e)** $200\ (J)$

20) What is the speed of the masses after displacement of $d = 2(m)$?

a) $\sqrt{6}\ (m/s)$ **b)** $6\sqrt{\frac{2}{3}}\ (m/s)$ **c)** $\sqrt{\frac{2}{3}}\ (m/s)$ **d)** $6\sqrt{2}\ (m/s)$ **e)** $5\sqrt{6}(m/s)$

----------**USE FOR SCRATCH WORK**----------