Name: _____

Surname: _____

Student No.: _____

Group: _____

9th November 2022

Near East University

2022 – 2023 Fall Semester

Physics 101 – Engineering Department

MIDTERM EXAM

Instructions

- Read the questions carefully and make sure that you understand them.
- You are NOT allowed to use mobile phones and pocket computers.
- Be direct in your answers. You may lose points for including irrelevant and extra information.
- The exam is out of 100 points.
- The duration of the exam is 90 minutes.
- During the exam you might need these formulas:

$\bar{v} = \frac{\Delta x}{\Delta t}$ $v = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$ $\bar{a} = \frac{\Delta v}{\Delta t}$ $a = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt}$	$v = v_o + at$ $x = x_o + v_o t + \frac{1}{2} a t^2$ $v^2 = v_o^2 + 2a(x - x_o)$ $\bar{v} = \frac{v_o + v}{2}$ $V_x = V\cos\theta$ $V_y = V\sin\theta$	$V = \sqrt{V_x^2 + V_y^2}$ $\tan\theta = \frac{V_y}{V_x}$ $\vec{v} = \frac{d\vec{r}}{dt} \quad \vec{a} = \frac{d\vec{v}}{dt}$ $\vec{v} = \vec{v}_o + \vec{a}t$	$\vec{r} = \vec{r}_o + \vec{v}_o t + \frac{1}{2}\vec{a}t^2$ $\sum \vec{F} = m\vec{a}$ $\vec{F}_{AB} = -\vec{F}_{BA}$ $\vec{F}_G = m\vec{g}$	$f_K = \mu_k F_N$ $f_S \leq \mu_s F_N$ $a_R = \frac{v^2}{R}$ $F = G\frac{m_1 m_2}{r^2}$
$W = \vec{F} \cdot \Delta\vec{l} = F\Delta l \cos\theta$		$\vec{A} \cdot \vec{B} = AB\cos\theta$	$\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z$	

Q1) Take $\vec{a} = 4\hat{\imath} - \hat{\jmath} + \hat{k}$ and $\vec{b} = -\hat{\imath} + 6\hat{\jmath}$. Calculate :

***SHOW YOUR WORK CLEARLY**

a) $\vec{a} + \vec{b}$ **(5 points)**

b) $\vec{a} - \vec{b}$ **(5 points)**

c) $\vec{a}.\vec{b}$ **(5 points)**

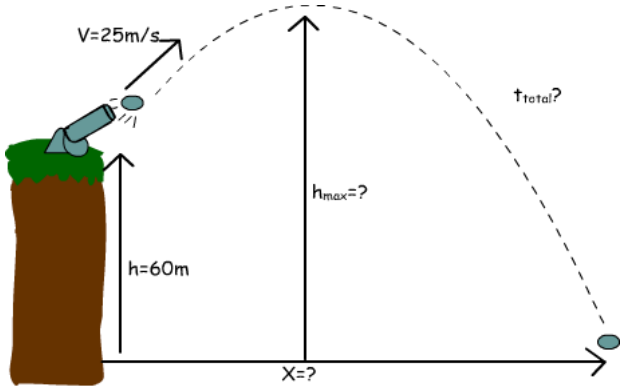
d) $\vec{a} \times \vec{b}$ **(5 points)**

Q2) An airplane starts from rest and accelerates at a constant $4m/s^2$ for 10 seconds before leaving the ground. ***SHOW YOUR WORK CLEARLY**

a) How fast was it going when it took off? **(10 points)**

b) How far did the airplane move? **(10 points)**

Q3) In the given picture, you see the motion path of cannonball. (The angle between cannonball and horizontal is 53º and sin53º=0, 8 and cos53º=0, 6, take $g = 10\text{m/s}^2$) ***SHOW YOUR WORK CLEARLY**



a) How long does it take the ball reach to the maximum point? **(10 points)**

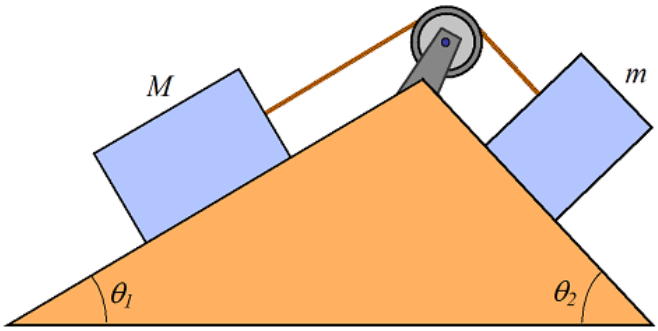
b) Find the maximum height it can reach. **(10 points)**

c) Find the total time it takes to reach to the level ground. **(10 points)**

d) Find the horizontal distance it covers. **(10 points)**

Q4) Two blocks of mass m and M are connected via pulley with a configuration as shown. The surfaces are frictionless. If M=20 kg and m=10 kg and θ1=30 and θ2=60 Take $\frac{\sqrt{3}}{2} = 0.8$

***SHOW YOUR WORK CLEARLY**



a) Find the acceleration of the system. **(10 points)**

b) What is the tension in the string? **(10 points)**

Good Luck
Fatemeh Mirekhtiary

END