



TISHK INTERNATIONAL UNIVERSITY

Faculty of Education
Department of Physics Education
Course: **Mechanics II** Code: **PHYS 216**
2018-2019 Ac. Year, Spring Term

Date : 20.05.2019
Duration : 60 min
Type of Exam: ☐ Mid-Term Exam

Full Name:

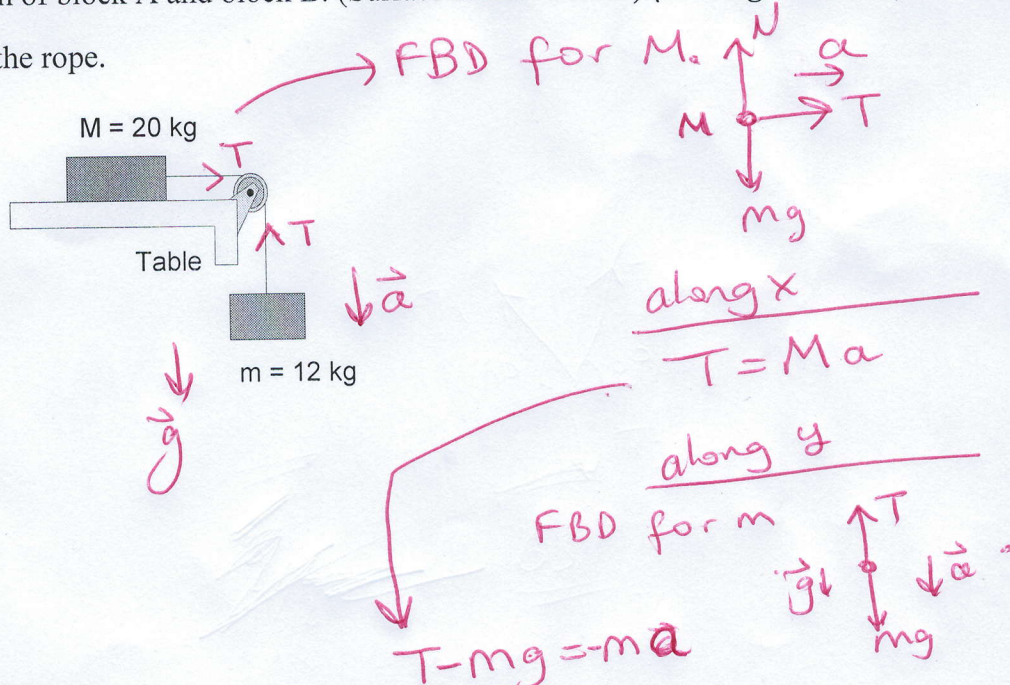
Total Mark:

Instruction: The total point you will get is 20.

Question 1 - (4 points): Look at the figure below.

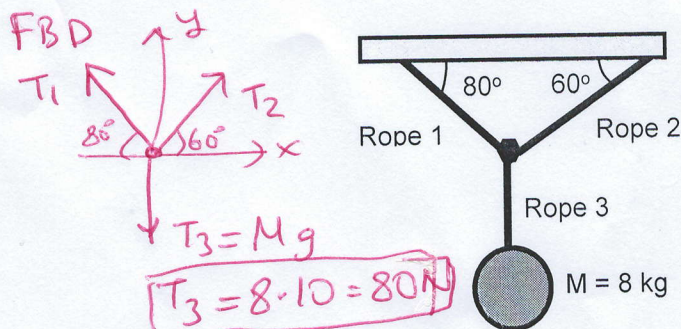
a) Calculate the acceleration of block A and block B. (Surface is frictionless.) (Take $g = 10 \text{ m/s}^2$)

b) Calculate the tension in the rope.



Question 2 - (4 points):

Calculate the tensions in the three ropes? (Take $g = 10 \text{ m/s}^2$)



Along x $\Rightarrow T_1 \cos 100 + T_2 \cos 60 + T_3 \cos 270 = 0$
 $T_1 (-0.17) + T_2 (0.5) + 80(0) = 0$
 $T_2 = 0.37 T_1$

Along y $\Rightarrow T_1 \sin 100 + T_2 \sin 60 + T_3 \sin 270 = 0$
 $T_1 (0.98) + T_2 (0.86) + 80(-1) = 0$
 $T_1 (0.98) + (0.37) T_1 (0.86) = 80 \Rightarrow (1.27) T_1 = 80$
 $T_1 = 63 \text{ N}$

a) $a = 3.75$

b) Tension $\Rightarrow T = Ma$
 $T = 20 \cdot 3.75 = 75 \text{ N}$



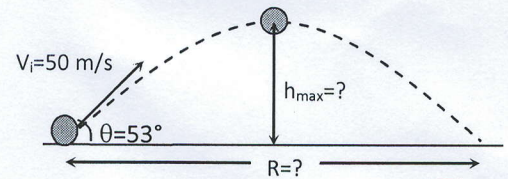
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Question 3 - (4 points): Use the given information in the figure. (Take $g = 10 \text{ m/s}^2$)

- Calculate the horizontal velocity at the top.
- Calculate the maximum height
- Calculate the range of the projectile in the figure.



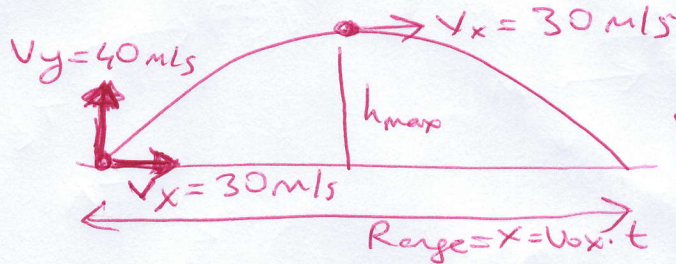
a) $V_{0x} = V_i \cdot \cos 53 = 50 \cos 53 = 30 \text{ m/s}$

$V_{0y} = V_i \sin 53 = 40 \frac{\text{m}}{\text{s}}$

b) $V_f^2 = V_{0y}^2 + 2g \Delta y$

$0 = 40^2 + 2(-10) \Delta y$

$\Delta y = \frac{1600}{20} = 80 \text{ m} = h_{\text{max}}$



Horizontal velocity is the same at each point on the projectile motion.

c) $\text{Range} = X = V_{0x} \cdot t_{\text{fly}}$ $t_{\text{fly}} = 2 \times t_{\text{up}}$ $V_{fy} = V_{0y} + g t_{\text{up}}$ $0 = 40 + (-10) t_{\text{up}}$
 $t_{\text{up}} = 4 \text{ s}$ $t_{\text{fly}} = 8 \text{ s}$
 $X = 30 \cdot 8 = 240 \text{ m}$

Question 4 - (4 points): A car starts from rest and reaches 30 m/s in 6 seconds.

- Calculate the acceleration of the car.
- Calculate the distance taken by the car.



a) $V_f = V_0 + at$ $t = 6 \text{ s}$ $V_0 = 0$ $V_f = 30$

$30 = 0 + a \cdot 6$ $a = 5 \frac{\text{m}}{\text{s}^2}$

b) $x = V_0 t + \frac{1}{2} at^2$ $x = 0 \cdot t + \frac{1}{2} 5 (6)^2 = 5 \cdot 18 = 90 \text{ m}$

Question 5- (4 points): Choose the best answer.

- Describe the motion of a person if the car stops suddenly. (The person is **not** wearing a seat belt)
 - The person and car will stop together.
 - The person will stop faster than the car because the person is lighter than the car.
 - ☒ The car will stop and the person will keep moving forward because of inertia.
 - The car will stop and the person will speed up.
- A paper is staying at rest on the desk. Which of the following statements best describes this situation?
 - There are no forces acting on the paper.
 - The paper pushes on the desk only.
 - The desk pushes on the paper only.
 - ☒ The forces acting on the paper are balanced.

- Which force always pulls downward on objects?

a. Tension force b. Friction force c. ☒ Gravity d. Air resistance



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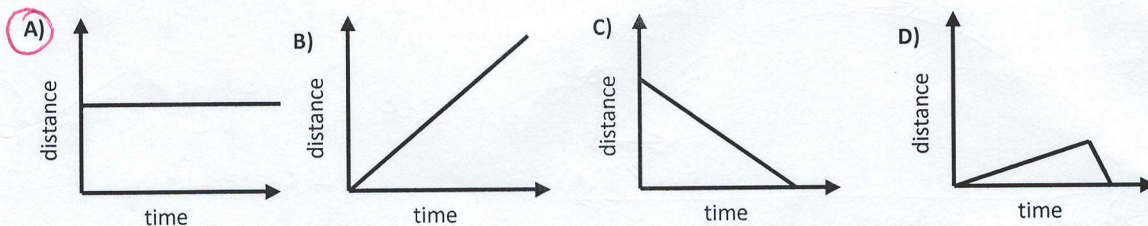
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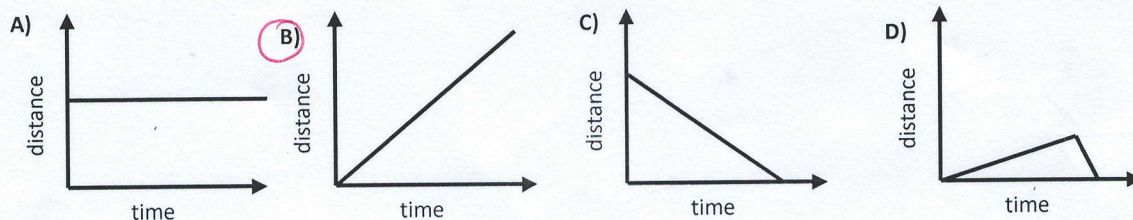
- 4) A bird flies 50 meters in 10 seconds. What is the bird's speed?
a. 500 m/s b. 50 m/s c. 5 m/s d. 10 m/s

$$v = \frac{x}{t} = \frac{50}{10} = 5 \text{ m/s}$$

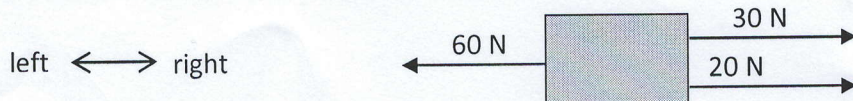
- 5) Which graph best matches a person sitting on a chair and waiting?



- 6) Which graph best matches a person walking away from a point at a constant speed?



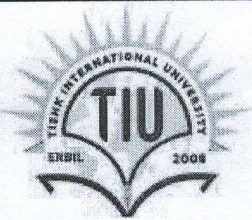
- 7) Three forces acting on the box shown below. What is the net force on the box?



$$\text{Resultant} = 60 - 50 = 10 \text{ N to the left}$$

60 N \longleftrightarrow 50 N

- a. 10 N to the left b. 10 N to the right c. 60 N to the left d. 50 N to the right



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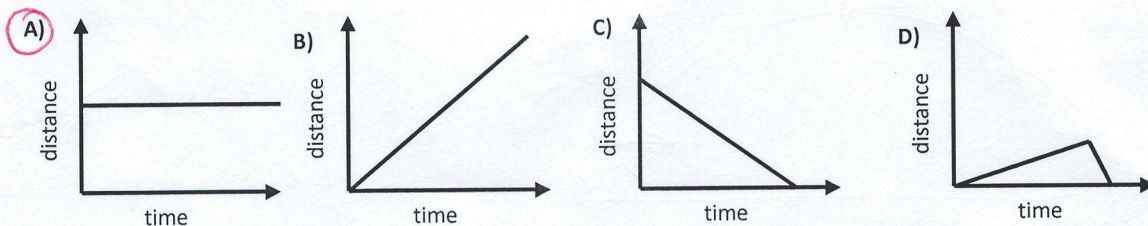
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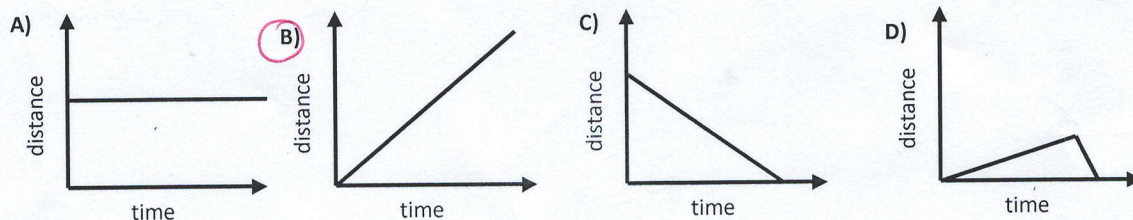
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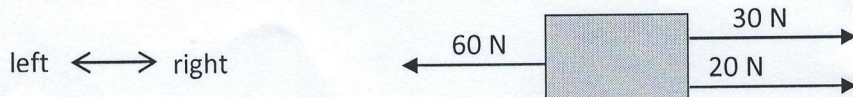
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