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ALUPE UNIVERSITY COLLEGE

...Bastion of Knowledge....

P. O.Box 845-50400 Busia(K)
principal@auc.ac.ke
Tel: +254 741 217 185
+254 736 044 469
off Busia-Malaba road

OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELOR

OF SCIENCE IN COMPUTER SCIENCE

SCHOOL: SCIENCE

COURSE CODE: PHY 110

COURSE TITLE: BASIC PHYSICS

DATE: 11th December, 2017 **TIME:** 2.00pm-5.00pm

INSTRUCTION TO CANDIDATES: SEE INSIDE

THIS PAPER CONSISTS OF 23 PRINTED PAGES

For examiner's Use Only

Question	I.E	E.E
CAT		
EXAM		
TOTAL		

PLEASE TURN OVER

Insert the numbers of the questions you have answered in the order done

Student Admission No………………………Exam Card No…………………Signature…………

INSTRUCTIONS TO CANDIDATES

1. Write your **Admission Number**, **Exam Card Number** and **Sign** in the spaces provided at the bottom of each page of the Examination Booklet. DO NOT write your name anywhere in this booklet.

2. Write on both sides of the pages.

3. All rough work must be done in the Answer sheets and crossed through.

4. If supplementary pages are used, they must be fastened all together at the end of this Booklet. Supplementary pages should be used only after all the leaves in the booklet have been exhausted.

5. It is a serious examination offence to cheat or to have unauthorized materials including **MOBILE PHONES** (whether on or off) in the examination venue.

6. In no circumstances must Answer Booklet used or unused, be removed from the examination room by a candidate.

7. The Booklet is for **Examination use only** in a designated examination room. Unauthorized possession of the Answer sheets by a student or any other person constitutes an examination irregularity calling for stiff disciplinary action.

8. Do not pluck any page from this Booklet. Any extra/unused answer sheets should be returned to the **Examination Office.**

9. Candidates who come to examination room 30 minutes late will not be allowed to sit for the exam.

10. Candidates will not be allowed to leave the exam room once the exam commences.

11. Candidates are advised that importance is attached by examiners to accuracy and clarity of expression.

12. Committing any form of irregularity is prohibited and shall attract severe disciplinary action in accordance with Alupe University College Examination Regulations.

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INSTRUCTIONS TO CANDIDATES

Answer **QUESTION ONE** and **ANY OTHER THREE** questions.

Question 1 carries **24** marks and the others carry **12** marks each.

You may need to use the following constants

- ☐ Density of water= $1.0 \times 10^3 kg/m^3$

- ☐ Acceleration due to gravity g=9.8 m/s^2

- ☐ Universal gravitational constant G=6.67 x10^{-11}Nm^{2}kg^{-2}

- ☐ Mean radius of the earth Re=6400 km

- • Mass of the Earth, Me, = 5.98×10^{24} kg

SECTION A   ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE

a) (i)Distinguish between vector and scalar quantities and give an example of each   **2mk**

(ii) If **A** = 2i + 3j + 4k and B = 5i+6j+7k then what is $\vec{A} \times \vec{B}$ and $\vec{A} \cdot \vec{B}$|.   **3mk**

b) An electron in A cathode ray tube (CRT) accelerates from 2.00×10^4m/s to 6.00×10^6m/s over 1.50 cm.

(i) How long does the electron take to travel this 1.50 cm?

(ii) What is its acceleration?   **2mk**

c) Two masses of 0.8Kg and 1.2 Kg are connected by a light inextensible string, which passes over a smooth pulley. If the system is released from rest with the string, determine,

   (i) The acceleration of the system

   (ii) The tension in the string

   (iii) The distance travelled in 0.5 s.   **1, 1, 1mk**

d) State any two Kepler's Laws of planetary motion.   **2mk**

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QUESTION TWO

a) Derive the three equations of linear motion   **3mk**

b)   What is simple harmonic motion? Prove that the total energy of a body executing simple harmonic motion remains constant.   **3mk**

c) State Bernoulli's theorem and the law of continuity   **2mk**

d) Distinguish between longitudinal and transverse waves   **2mk**

e) State the laws of friction   **2 mk**

SECTION B : ANSWER ANY THREE QUESTIONS IN THIS SECTION

QUESTION THREE

a) What physical designs dictate the difference in speeds between a fighter-jet and a helicopter? **2mks**

b) Describe how a driver can steer a car traveling at constant speed so that

(i) the acceleration is zero or

(ii) the magnitude of the acceleration remains constant.   **2mk**

c) A ball is thrown in such away that its initial vertical and horizontal components of velocity are 40m/s and 20m/s, respectively. Estimate the total time of flight and the distance the ball is from its starting point when it lands.   **3mk**

d) Two blocks of mass 3.50 kg and 8.00 kg are connected by a massless string that passes over a frictionless pulley. The inclines are frictionless. Find

(i) The magnitude of the acceleration of each block and

(ii) the tension in the string.   **5mk**
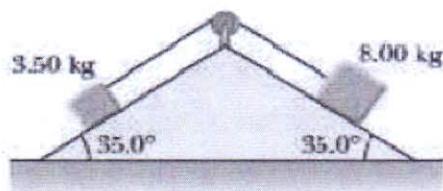
QUESTION FOUR

a) A person weighs a fish of mass m on a spring scale attached to the ceiling of an elevator. Show that if the elevator accelerates either upward or downward, the spring scale gives a reading that is different from the weight of the fish. Suppose the elevator cable breaks, so that the elevator and its contents are in free-fall. What happens to the reading on the scale?   **3mk**

b)(i)   What is escape velocity?

(ii)   Determine the escape velocity for a body on the moon given the radius, R of the moon is $1.74 \times 10^6 m$ and the mass of the moon is $7.36 \times 10^{22} kg$.   **4mk**

c) A plane of mass 6000kgrams into a tower of mass 600Kg. The velocity of the plane before impact is 200km/hr and the initial velocity of the car is 140km/hr. Find the final velocity of the system of the junk. Is KE conserved in this system?   **5mk**

QUESTION FIVE

a) Define surface tension and state factors that affecting it.   **4mk**

b) State Newton's law of Universal Gravitation   **1mk**

c) Show that the acceleration due to gravity g at height h above the earth's surface is given by

$$g_h = \frac{g}{\left(1 + \dfrac{h}{R_e}\right)^2}$$

Where g_o is the acceleration due to gravity on the earth and Re is the radius of the earth. **7mk**

QUESTION SIX

a) State Hooke's law   **2mk**

b) A 0.12kg mass attached to a spring oscillates with amplitude A=0.075m and a maximum speed of   0.524 m/s. Find;

(i) The spring constant

(ii) The period

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(iii) The maximum acceleration   **2, 2, 2mk**

c) A rod 4.2 m long and 0.50 cm^2 in cross-sectional area is stretched 0.20 cm under a tension of 12.0 N. Calculate;

    (i)   Stress and strain

    (ii)   Young's modulus   **2,2mk**

QUESTION SEVEN

a) Briefly highlight the various heat transfer modes   **3mk**

b) A horizontal pipe of radius10 mm is joined to a horizontal pipe with radius15 mm with both pipes at the same height. A fluid flows through both pipes from the narrow pipe to the wider pipe with an average velocity of 3mm/sin the narrow pipe. Assume that the fluid has zero viscosity and the density of the fluid is equal to the density of water.

    (i)   What is the volume flow rate?   **1mk**

    (ii)   What is the average speed for the wider pipe?   **2mk**

    (iii)   What is the pressure difference between the two pipes?   **5mks**

c) An aluminum stick of length 1.5 m is cooled from 20^0 C to -180^0 C. Find the final length if its coefficient of linear expansion is 23×10^{-6}/K?   **3mk**