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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 EDUCATION (SCIENCE)

SCHOOL: EDUCATION AND SOCIAL SCIENCES

COURSE CODE: PHY 112

COURSE TITLE: MECHANICS

DATE: 21ST December, 2017 **TIME:** 2.00pm-5.00pm

INSTRUCTION TO CANDIDATES: SEE INSIDE

THIS PAPER CONSISTS OF 20 PRINTED PAGES

PLEASE TURN OVER

For examiner's Use Only

Question	I.E	E.E
CAT		
EXAM		
TOTAL		

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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INSTRUCTION TO CANDIDATES

i) Answer **QUESTION 1 and 2** from section A and **ANY OTHER THREE** from section B. Each **QUESTION** carries **12 marks.**

ii) Take acceleration due to gravity to be 9.8 m/s^2

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SECTION A

QUESTION 1

(a) i) Define scalar and vector quantities (2 marks)

ii) Find the angle between two vectors A=2i+3j-k and B= -i+j+2k (2 marks)

(b) (i) What is the difference between velocity and speed (2marks)

(ii) An object is dropped into a well and hits water 2 seconds after being released. How deep is the well? (2 marks)

(c) (i) Define force (1 mark)

(ii) State the law of conservation of linear momentum (1 mark)

(iii) A constant force acts on a 5kg object and reduces its velocity from 7m/s to 3m/s in a time of 4s. Find the force. (2 marks)

QUESTION 2

(a) i)What is centripetal force? (2marks)

(ii) A stone of mass 0.4 kg is tied to a string of length 0.5 m and whirled in a circle. If the stone revolves uniformly and makes one complete revolution per second, calculate the acceleration and the force exerted on the stone by the string. (3 marks)

b) i) State the Newton's law of gravitation (2 marks)

ii) The weight of a person on the earth is 600 N. The gravitational field of the moon is $1/6^{th}$ of the gravitational field of the earth. What will be the weight of the person on the moon? (2 marks)

ii) If the radius of the earth is 6.37×10^6 m and acceleration due to gravity is 9.81 m/s^2, then calculate the mass and density of the earth. (3 marks)

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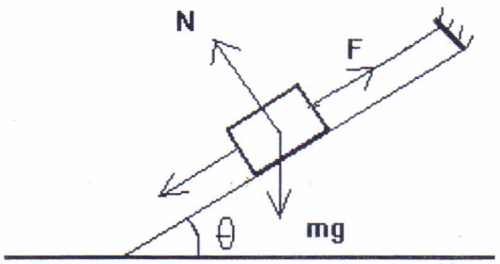
(c) A cord holds stationary a block of mass 15 kg on a frictionless plane that is inclined at angle $\Theta = 27^{\circ}$ as shown below.



i) What is the magnitude of the tension, T on the block from the cord and the normal force, N on the block from the plane? (4 marks)

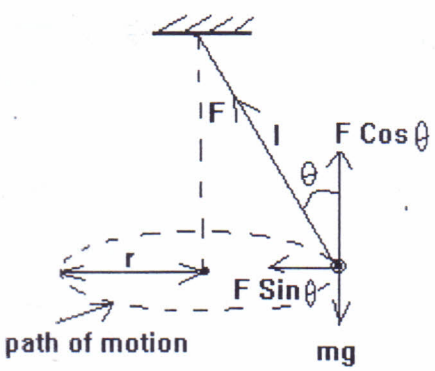
ii) If the cord is cut, so that the body slides down the plane, calculate the acceleration of the body.

(2 marks)

QUESTION 6

a) Define angular velocity and angular acceleration. (2 marks)

b) i) A pendulum bob moves in such a way that it describes a horizontal circle as shown in the figure below. Show that the period of motion is $T = 2\pi\sqrt{\frac{LCos\theta}{g}}$ (5 marks)



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ii) If a pendulum bob of mass 0.50 kg is attached to one end of a string of length 150 cm. The bob moves in a horizontal circle in such a way that the string is inclined at 10 ° to the vertical. Calculate the tension in the string. (2 marks)

(c)State Kepler's laws (3 marks)

QUESTION 7

a) A particle of mass m moves in space under influence of a force field F. Assuming that at times $t_1$and t_2, the velocity is v_1 and v_2 respectively. Prove that work done is the change in kinetic energy. (6 marks)

b) i) Distinguish between streamline flow and turbulent flow. (2 marks)

ii) State the principle of continuity of fluids (1 mark)

iii) In a pipe of non-uniform cross-section the velocity of water is 0.4m/s at a place where the pressure is 0.02m (mercury). If at any other place the velocity of water is 0.8m/s, then what will be the pressure there? (Take density of mercury = 13600 kg/m^3 and density of water = 1000 kg/m^3). (3marks)

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