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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES**

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE WITH IT**

**2ND YEAR 1ST SEMESTER 2016/2017 ACADEMIC YEAR**

**MAIN CAMPUS**

**COURSE CODE: SPH 203**

**COURSE TITLE: MATHEMATICAL METHODS FOR PHYSICS 1**

**EXAM VENUE: LAB 1 STREAM: (BED Sc.)**

**DATE: 28/04/16 EXAM SESSION: 2.00 – 4.00PM**

**TIME: 2 HOURS**

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1. **Answer question 1 (compulsory) and ANY other 2 questions.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**1.**

(a) From the first principle of differentiation obtain the derivative of the function  (3 mks)

(b) Given  show that  (4mks)

(c) Evaluate the following integrals

(i)  (3mks)

(ii)  (3 mks)

(d) Determine if the following sets of vectors are linearly independent

(i)  ,  (2 mks)

(ii)  ,  (2 mks)

(e) A particle of mass 2 moves in a force field depending on time t given by



Assuming that at the particle is located at  and has velocity ,find

1. The velocity (3 mks)
2. The position at any time t (3mks)

(f) Verify that the following equation is an identity

 (4 mks)

(g) Find the angle between the vectors  and  (3mks)

**QUESTION TWO**

**(a)** (i) Find from the first principle the first derivative of  and compare your results with that obtained using chain rule (5 mks)

(ii) Given 

(I) Find displacement from  to  (2 mks)

(II) Find the instantenous velocity  (3mks)

(III) Find  for  (2mks)

(b) Evaluate the following integral 

(i) Using integration by parts (3 mks)

(ii) Using a standard calculus 1 substitution. Comment on the two answers obtained in (i) and (ii) (5 mks)

**QUESTION THREE**

1. (i) Find the volume V of the parallelepiped with sides ,  and  (6 mks)

(ii) Construct reciprocal vectors of  (6 mks)

1. (i) Show that if , for some scalar ,then  (4 mks)

(ii) Find the area A of the parallelogram with sides  and  (4 mks)

**QUESTION FOUR**

1. Initially a pendulum swings through an arc of 18 inches. On each successive swing the length of the arc is 0.98 of the previous length .

(i) What is the length of arc after 10 swings ? (2 mks)

(ii) On which swing is the length of arc first less than 12 inches ? (4 m)

(iii) After 15 swings, what total length will the pendulum have swung ? (3 mks)

(iv) When it will stop , what total length will the pendulum have swung ? (3 mks)

1. (i) Use L’Hopital’s rule to evaluate

 (4 mks)

(ii) Find  (4 mks)

**QUESTION FIVE**

1. Solve the hyperbolic equation

 (7 mks)

1. (i) Verify the relation

 (5 mks)

(ii) Evaluate  using the logarithmic form of the inverse (8 mks)

