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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2019/2020 ACADEMIC YEAR FOUR**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: PHY 435E**

**COURSE TITLE: DYNAMICS**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 13/02/2020 TIME: 2.00-4.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of THREE (3) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. State Newton’s laws of motion and their implications as physical laws **[6 marks]**
2. Differentiate between inertial and gravitational mass **[2 marks]**
3. State the law of conservation of linear momentum **[1 mark]**
4. Show that is a conservative field **[6 marks]**
5. Find the potential **[4 marks]**
6. the work done in moving an object in this field from (I,-2,1) to (3,1,4) **[3 marks]**
7. Differentiate betwween holonomic and nonholonomic constraints **[2 marks]**
8. Find the kinetic energy of rotation of a rigid body with respect to the principal axes in terms of Eularian angles and interpret the result when *A = B* **[6 marks]**
9. State the principles that must be taken into account when choosing a suitable set of generalized coordinates in a given problem **[3 marks]**

**QUESTION TWO**

1. State the principle of virtual work hence show that A system of particles is in equilibrium only if the total virtual work of the actual or applied forces is zero **[8 marks]**
2. An inextinsible string of negligible mass hanging over a smooth peg at *A* connects the mass *m* on a frictionless inclined plane of angle θ to another mass *m*2. Use D’Alembert’s principle to prove that the masses will be in equilibrium if  **[12 marks]**

*m*2*g*

*m*1

B

C

A

θ

*m*2

*m*1*g*

**QUESTION THREE**

1. Two particles of masses *m*1and *m*2 are located on a frictionless double inclined plane and connected by an inextensible massless string passing over a smooth peg.
2. Use the principle of virtual work to show that for equilibrium **[8 marks]**



where θ1 and θ2 are angles of the incline.

1. Use D’Alembert’s principle to describe the motion of the masses **[6 marks]**
2. If a rigid body with one fixed point rotates with angular velocity  and has angular momentum , prove that the kinetic energy is given by . Hence show that the kinetic energy can be written as **[6 marks]**



**QUESTION FOUR**

Derive the general form of Lagrange’s Equation and hence show that it varnishes for a conservative system  **[20 marks]**

**QUESTION FIVE**

1. A particle of mass *m* is moving in a plane under an inverse square law attractive force. Set up the Lagrangian and hence obtain the equation describing its motion **[10 marks]**
2. Set up the Lagrangian for a simple pendulum and derive the equation describing its motion **[10 marks]**