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**National Open University of Nigeria**

**Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja**

**Faculty of Science**

 **2017\_2 Semester Examination**

Course Code: **PHY457**

 Course Title: **ENVIRONMENTAL PHYSICS**

Credit Unit: 3

 Time: **3 Hours**

Instruction: **Answer question 1 and any other four questions.**

**PHYSICAL CONSTANTS**:

*Speed of light* $c=2.9979 ms^{-1}$*; mass of electro* $m\_{e}=0.9110×10^{-31}kg$*; Electronic charge* $e=1.6022×10^{-19}C$*; Avogadro’s number* $N\_{A}= 6.0221×10^{26}kmol^{-1};$ *Boltzmann constant* $k=1.3806×10^{-23}JK^{-1}$*; Plank’s constant* $h=6.6257×10^{-34}Js$*;* $μ\_{0}=4π×10^{-7}Henry/m$.

*1.(a) What is environmental modeling?* ***2 marks***

*(b) Mention and discuss three environmental modeling software* ***8 marks***

*(c) Discuss the two aggregation rules for effective cost benefit analysis* ***4 marks***

*2. (a) Write down the equation of the force function for a many-body system* ***2 marks***

 *(b) Given that the moment of inertiais a function defined by ,*

*show that *

*and explain the physical significance of the equation.* ***5 marks***

*(c) Discuss concept transfer between orbits. Under what condition is the orbit of the satellite a conic section?* ***7 marks***

*3. a) Briefly account for the isothermal condition of the upper atmosphere* ***4 marks***

*(b)Show that the density of the adiabatic atmosphere is related to the change in height by the equation*

*****6 marks***

*(c)Assuming that  and estimate the limit of the adiabatic atmosphere.****4 marks***

*4. (a) Consider two bodies of masses  and  separated by a linear displacement . Derive an equation that shows that the centre of mass of the system moves with constant velocity.*

***8 marks***

 *(b) Write down the equation to show that the solution of the two-body problem is a conic section*

***2 marks***

*(c) The orbit of a satellite about the Earth is classified by the value of the eccentricity.*

 *Discuss the four cases of the eccentricity* ***4 mark***

*5. Write short notes on*

*(a) Thermal gradient winds* ***5 marks***

*(b) Green house effects* ***5 marks***

*(c) Global warming* ***5 marks***

*6.(a) Enumerate the properties that characterize the terrestrial atmosphere* ***2 marks***

 *(b) Explain the term lapse rate* ***4 marks***

*(c) Show that for an adiabatic atmosphere * ***8 marks***