TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPOMA IN BUILDING & CIVIL ENGINEERING (DBC 13J)

APS 2101: PHYSICS FOR ENGINEERS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2013
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
 - *Answer Booklet*
This paper consist of **FIVE** questions in **TWO** sections **A** & **B**
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question One

a) Using graphical illustrations state and explain the Ohm's Law **(6 marks)**

b) With the aid of diagrams, explain how you would perform the following measurements:
   (i) Voltage in a circuit
   (ii) Current in a circuit
   (iii) Resistance in a circuit **(9 marks)**

c) Calculate the resistance of a copper wire of 240m with a cross-section area of 1.5mm^2
   (ρ for copper = 0.0175 x 10^{-6} Ω m) **(3 marks)**

d) Calculate the length of a steel wire of 0.8mm diameter having resistance of 192 Ω .
   (ρ for steel = 0.13 x 10-6 Ω m) **(2 marks)**

SECTION B (Answer any TWO questions from this section)

Question Two

a) Define the following terms:
   (i) Resistivity
   (ii) Charge
   (iii) Electromotive force
   (iv) Capacitance **(8 marks)**

b) (i) State the Law of floatation **(2 marks)**

(ii) A spherical bob of mass 194g and radius 10.5cm is suspended by a spring balance and completely immersed in oil of density 0.8g/cm^3. Calculate:
   (i) Density of the spherical bob
   (ii) Reading in the spring balance **(10 marks)**

Question Three

a) State the Hooke's Law **(2 marks)**

b) The values in the table below were obtained for the period (T) of vertical oscillation of a steel spiral loaded with different weights:

Weight W (N)	0.25	0.5	0.75	1.00	1.25
Period T (sec)	0.95	1.15	1.30	1.40	1.55
T^2					

(i) Complete the table

(ii) Plot the graph of T^2 against W   **(7 marks)**

$$T = 2\pi \sqrt{\dfrac{w + Ws}{gk}}$$

c) Supposing W and T are related by the equation

Where: Ws is the weight of the spring

K is the spring constant

W is the load weight and

g is the gravitational acceleration from your graph in b(ii), determine the values of Ws and K   **(6 marks)**

d) Describe the following terms:
(i) Mechanical Advantage
(ii) Velocity Ratio   **(5 marks)**

Question Four

a) Define:
(i) The Radian
(ii) Angular displacement
(iii) Angular velocity   **(6 marks)**

b) A bob having a mass of 1kg is moving in a uniform circular path in a vertical plane having a radius of 1M. If it is whirled with the frequency of 2 cycles/second. Calculate:
(i) Tension in the string when the bob is at the top most part of the circle
(ii) Tension when the bob is at the bottom
(iii) At what position of the object is the string likely to break
(iv) What is the maximum speed required to maintain the string under tension?   **(14 marks)**

Question Five

a) State the Kinetic theory of matter   **(2 marks)**

b) A refrigeration maker use of the cooling effects caused by evaporation. What is the function of the following parts of a refrigeration
(i) Pump
(ii) Cooling fins
(iii) Thermostat   **(6 marks)**

c) A stone of mass 2kg is attached to a string 3m long and made to revolve in a horizontal circle of radius 1m. Find:
(i) The tension in the string
(ii) The linear velocity
(iii) The angular velocity   **(12 marks)**