TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBC 13M)
DIPLOMA IN ARCHITECTURE (DA 13M)

APS 2101: PHYSICS FOR ENGINEERS

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2013
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*
- *Mathematical Tables*
- *Scientific Calculator*

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) State:
    (i)   Newtons second law of Motion   **(1 mark)**
    (ii)   Law of inertia   **(2 marks)**

b) Explain the factors affecting the capacitance of a capacitor   **(4 marks)**

c) Two trolleys of Mass 2kg and 1.5kg are travelling towards each other at 0.20 ms^{-1} and 0.35ms^{-1} respectively. The trolleys combined in collision. Calculate:
    (i)   The velocity of the combine trolleys
    (ii)   In what direction the trolley move after collision   **(4 marks)**

d) With the aid of circuit diagrams show how the following measurement can be taken. Also state their respective conditions.
    (i)   Current in a circuit
    (ii)   Voltage in a circuit
    (iii)   Resistance in a circuit   **(8 marks)**

SECTION B (Answer any TWO questions from this section)

Question Two

a) An electric heater takes a current of 12.5A from 240V power supply. Determine:
    (i)   Its power rating
    (ii)   Its resistance   **(4 marks)**

b) (i) Define centripetal force   **(1 mark)**
    (ii) Name the force providing centripetal force in:
        -   An electron moving around a nucleus
        -   Moon moving around the earth   **(4 marks)**

c) An object of mass 3kg is attached to a string of 2M long and made to revolve in a horizontal circle of radius IM. Find:
    (i)   The tension in the string   **(3 marks)**
    (ii)   The linear velocity   **(3 marks)**
    (iii)   The angular velocity   **(3 marks)**

Question Three

a) Explain the functions of the following parts of a refrigerator:
    (i)   Pump   **(2 marks)**

    (ii)   Cooling fins   **(2 marks)**

(iii) Thermostat **(2 marks)**

b) Explain the following:
  (i) Charge
  (ii) Electromotive force
  (iii) Resistivity
  (iv) Energy **(3 marks)**

c) State the ohm's law and the conditions that are necessary for a conductor to obey the law **(2 marks)**

Question Four

a) Determine the maximum and minimum values of the following resistors given their colour codes. (answers in KΩ)
  (i) Red, blue, yellow, gold
  (ii) Yellow, green, black
  (iii) Green, yellow, orange, red
  (iv) Blue, black, purple, silver **(12 marks)**

b) An uncharged capacitor is charged by a constant of 2mA for 3 seconds. The potential difference between the plates after this time is 15V. Determine the capacitance of the capacitor. **(2 marks)**

c) State the factors you would consider when making a coil for an immersion heater **(2 marks)**

d) State the difference between A.C and D.C energy **(2 marks)**

Question Five

a) Determine the colour codes of the following resistors:
  (i) 470K$\Omega \pm 10\%$
  (ii) 0.19M$\Omega \pm 5\%$
  (iii) 3300K$\Omega \pm 20\%$
  (iv) 0.46K$\Omega \pm 2\%$ **(4 marks)**

b) Explain the following:
  (i) Mutual induction
  (ii) Self induction **(2 marks)**

c) State the Archimedes principle **(1 marks)**

d) A block of glass of mass 250g floats in mercury. What volume of glass lies under the surface of mercury? (Density of mercury is 13.6 x 103kgm^{-3}) **(3 marks)**