TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

PRECERTIFICATE IN INFORMATION TECHNOLOGY (PCIT 13S)

APS 1053: FUNDAMETNALS OF PHYSICS

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

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

This paper consist of **FIVE** questions
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

Question One (Compulsory)

a) Describe FOUR factors that affect resistance of a conductor **(8 marks)**

b) State the following:
   (i)   Kirchhoff's Law on current (KLC)
   (ii)   Kirchhoff's Law on voltage (KLC) **(4 marks)**

c) Define the following terms stating their SI units:
   (i)   Charge
   (ii)   Electromotive force
   (iii) Capacitance
   (iv)   Resistivity **(4 marks)**

d) (i) Calculate the resistivity of a wire length 40cm and cross-section area of 0.08m² and resistance of 1.5 Ω **(2 marks)**

   (ii) Calculate the resistance of a copper wire of 240m with a cross-section area of 1.5mm² (ρ for copper = 0.0175 x 10⁻⁶ Ω **(2 marks)**

Question Two

a) Explain the following:
   (i)   Rectification **(2 marks)**
   (ii)   Voltage regulation **(2 marks)**

b) With the aid of symbolic diagrams, explain the following with regard to diodes.
   (i)   Forward biasing
   (ii)   Reverse biasing **(4 marks)**

c) Three capacitors of 470 μF, 300 μF and 150 μF are connected in series and then connected in parallel to a 100 μF capacitor. The circuit is supplied with 12V.D.C. Determine:
   (i)   Total capacitance in the circuit
   (ii)   Charge across the circuit
   (iii) Total energy in the circuit **(6 marks)**

d) (i) Calculate how much current is taken by a bulb whose rate is 100 Ω and which is designed for mains supply of 250V. **(2 marks)**

   (ii) With the aid of a symbolic diagrams, describe:
      -   Step-up transformer

- Step-down transformer **(4 marks)**

Question Three

a) Two resistors of 100 Ω and 150 Ω are connected in series and then connected in parallel to a 130 Ω resistor. The circuit is supplied with 9V D.C. Determine:

    (i) Total current in the circuit

    (ii) Current through 130 Ω resistor

    (iii) Voltage drop across 150 Ω resistor

    (iv) Total power in the circuit **(8 marks)**

b) Describe the **THREE** factors that affect the capacitance of a capacitor **(6 marks)**

c) With the aid of a circuit diagram, explain the operation of a half wave rectifier circuit. **(6 marks)**

Question Four

a) Explain the following:
    (i) Frequency
    (ii) Period
    (iii) Amplitude **(6 marks)**

b) A transformer of 8:1 turns ratio is supplied with 110V produces 200W at the output. Calculate:

    (i) Primary current
    (ii) Secondary current
    (iii) Secondary voltage **(6 marks)**

c) Given the colour codes of the following resistors, determine the value of the resistors and calculate the maximum and minimum values in Kilo-ohm (K Ω)

    (i) Green, Yellow, Green
    (ii) Blue, Black, Red, Silver
    (iii) Red Blue, Yellow, Red
    (iv) Red, Red, Green, Gold **(8 marks)**

Question Five

a) Using graphical illustration, state and explain the Ohm's Law **(4 marks)**

b) Using symbols differentiate between P-N-P and N-P-N transistors **(4 marks)**

c) Explain FOUR energy losses in transformers and how they are minimized **(8 marks)**

d) With the aid of a circuit diagram, explain TWO applications of bipolar transistor **(4 marks)**