



**TECHNICAL UNIVERSITY OF MOMBASA**  
**Faculty of Applied & Health**  
**Sciences**

DEPARTMENT OF MATHEMATICS & PHYSICS  
DIPLOMA IN ANALYTICAL CHEMISTRY (DAC 14S)

APS 2101: PHYSICS I

**END OF SEMESTER EXAMINATION**  
**SERIES: DECEMBER 2014**  
**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) Define the following terms:

- (i) Resistance
- (ii) Reactance
- (iii) Impedance

**(6 marks)**

b) Determine the colour codes for the following resistor:

$\pm 20\%$

- (i)  $1.9M\Omega$   
 $330K\Omega \pm 10\%$
- (ii)  $470\Omega \pm 5\%$
- (iii)  $4.7M\Omega \pm 2\%$
- (iv)

**(4 marks)**

c) A capacitor is connected in series to a resistor of  $100K\Omega$  for charging. It took  $0.05\mu s$  to charge the capacitor to its time constant. Calculate the value of that capacitor. **(4 marks)**

d) A transformer with a turns ratio of 8:1 is supplied with 110V, 60Hz. If the secondary current is 10A. Calculate:

- (i) Primary current
- (ii) Secondary voltage
- (iii) Input power

**(6 marks)**

### Question Two

a) Define the following terms:

- (i) Depletion layer
- (ii) Base
- (iii) Emitter
- (iv) Collector

b) With the aid of circuit diagrams, explain the bipolar transistor configurations. **(6 marks)**

c) Using graph, sketches explain the following bipolar transistor characteristics. **(10 marks)**

- (i) Input
- (ii) Output
- (iii) Transfer characteristics

### Question Three

a) Using circuit diagram and wave form diagrams, explain the operation of a full wave bridge rectifier. **(10 marks)**

b) Three resistors of  $200K\Omega$ ,  $100K\Omega$  and  $80K\Omega$  are connected in parallel they are then connected in series to  $50K\Omega$  and  $75K\Omega$  resistors. The network is then supplied with 50V d.c.

- (i) Calculate the total resistance of the circuit

- (ii) Voltage drop in the parallel circuit
- (iii) Total current in the circuit
- (iv) Current through 20k, 100k and 80k resistors
- (v) Total power dissipated by the circuit

**(10 marks)**

#### Question Four

- a) Three capacitors of  $300\mu\text{F}$ ,  $20\mu\text{F}$  and  $400\mu\text{F}$  are connected in series and then connected to  $600\mu\text{F}$  capacitor in parallel. The network is then supplied with 30V d.c.
- (i) Draw the circuit diagram
  - (ii) Calculate the total capacitance in the circuit
  - (iii) Charge across the  $3600\mu\text{F}$  capacitor
  - (iv) Energy in the circuit
- b) Define the following terms:
- (i) Intrinsic semiconductor
  - (ii) Extrinsic semiconductor
  - (iii) Doping

#### Question Five

- a) Define the following terms:
- (i) Capacitance
  - (ii) Time constant
  - (iii) Transmission ratio
  - (iv) Self inductance
  - (v) Mutual inductance
- (10 marks)**
- b) With the aid of a graph, explain the ohm's law **(3 marks)**
- c) Using symbols differentiate between step-up and step-down transform. **(2 marks)**
- d) Calculate the maximum and the minimum values of the following resistors given the colour codes of the following resistors given the colour codes below: (all answers in  $\text{K}\Omega$ )
- (i) Red, green, yellow
  - (ii) Blue, black, purple, silver
  - (iii) Yellow, red, yellow, gold
- (5 marks)**