TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

CERTIFICATE IN BUILDING & CIVIL ENGINEERING (CBCE 13S)

APS 1101: PHYSICAL SCIENCE FOR ENGINEERS

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 **FOUR** printed pages

Question One (Compulsory)

a) State the Kirchhoff's Law on:
- **(i)** Current
- **(ii)** Voltage **(4 marks)**

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

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

d) Explain the following:
- **(i)** Rectification
- **(ii)** Voltage regulation **(4 marks)**

Question Two

a) Given the colour codes of the following resistors, determine the value of the resistors and calculate their maximum and minimum values in Kilo-ohm (K^{Ω}) **(8 marks)**

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

b) Explain how the following chemical bonds are formed.
- **(i)** Covalent bond
- **(ii)** Ionic bond
- **(iii)** Molecular bond **(6 marks)**

c) Find amount of $C_2 H_6$ produced using 0.3moles $C_2 H_2$ and 0.4 moles H_2 using the following chemical reaction:

$$C_2H_{2(g)} + 2H_{2(g)} \rightarrow C_2H_{6(g)}$$

(6 marks)

Question Three

a) A circuit Network consisting of capacitors is shown:

Calculate:
- **(i)** Total effective capacitance
- **(ii)** Total charge stored in the circuit
- **(iii)** Electrical energy stored in the circuit **(6 marks)**

b) State **FOUR** factors that affect the resistance of a wire **(4 marks)**

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

d) Calculate the length of a steel wire of 0.8mm diameter having resistance of 192 Ω (ρ for steel = 0.013×10^{-6} Ω m) **(3 marks)**

e) Explain the **THREE** transformer Losses and state how they can be minimized. **(3 marks)**

Question Four

a) Three resistors of 120 Ω, 50 Ω and 70 Ω are connected in parallel and then connected in series to a 100 Ω resistor. The circuit is supplied with 15V D.C. Determine:

(i) Total current in the circuit
(ii) Current through the 50 Ω resistor
(iii) Voltage drop across the 100 Ω resistor
(iv) Total power dissipated in the circuit **(8 marks)**

b) Distinguish between A.C and D.C energy citing at least two application of each. **(6 marks)**

c) With the aid of a circuit diagrams and wave form diagrams. Explain the operation of a full-wave bridge rectifier **(6 marks)**

Question Five

a) The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements. **(1 mark)**

A								K
B	D				G		I	
			F		H			L
C	E						J	

(i) Which letter represents an element which is least reactive? **(1 mark)**
(ii) Why are elements D and E referred to as Alkaline Earth Metals **(1 mark)**

b) (i) How are the atomic radius of F and H compare **(2 marks)**
(ii) Select two letters representing a pair of element that would react most expossively **(2 marks)**
(iii) Write an equation showing how D forms its ions **(2 marks)**

c) **(i)** Write the formulae of Bromide of D **(1 mark)**

(ii) Write the formulae of sulphate of C **(1 mark)**

d) What type of bonding exists between:

(i) E and I

(ii) G and J **(2 marks)**

e) (i) Explain why the melting point of J is higher than that of I **(2 marks)**

(ii) Apart from the decrease in energy levels, explain the difference between 1^{st} and 2^{nd} ionization energies **(2 marks)**

f) Using symbolic diagram, differentiate between forward biasing and reverse biasing a crystal diode. **(4 marks)**