TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

CERTIFICATE IN BUILDING & CIVIL ENGINEERING (CBCE 13M)

APS 1150: PHYSICAL SCIENCE FOR ENGINEERS

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: AUGUST 2016
TIME: 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

Mobile phones are not allowed inside the examination room
Do NOT write on the question paper

Question One (Compulsory)

a) State the following:
- **(i)** Kirchhoff Law on current
- **(ii)** Kirchhoff Law on voltage **(4 marks)**

b) Describe the factors that affect resistance of a wire. **(4 marks)**

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

d) Calculate the resistance of a copper wire of 240m with a cross-section area of $1.5mm^2$ (ρ for copper = 0.0175×10^{-6} Ω m) **(8 marks)**

Question Two

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

b) Two resistors of 100 Ω and 150 Ω are connected in series and the connected in parallel to a 130 Ω resistor. The circuit is supplied with 15v 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)**

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

Question Three

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

b) With the aid of symbolic diagrams. Explain the following with regard to diodes:
- **(i)** Forward Biasing
- **(ii)** Reverse Biasing **(6 marks)**

c) Three capacitors of 470 μF, 300 μF and 150 μF are connected in series and then connected in parallel

μF
to a 100 capacitor. The circuit is supplied with 12V D.C. Determine:

(i) Total capacitance in the circuit
(ii) Charge across the circuit
μF
(iii) Current through 100 capacitor
(iv) Total energy in the circuit **(10 marks)**

Question Four

a) With the aid of symbolic diagrams, describe:
(i) Step-up transformer
(ii) Step-down transformer **(4 marks)**

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

c) 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)**

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

Question Five

a) Explain the factors which affect the capacitance of a capacitor. **(4 marks)**

b) Describe the following terms:
(i) Mutual induction
(ii) Self induction **(6 marks)**

c) With the aid of a circuit diagram. Explain the operation of a temperature stabilized single transistor amplifier. Show that $U_{CC} = I_C R_C + UC_E + I_E \ R_E$ **(10 marks)**