



# MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL ENGINEERING

EPC 213: PRINCIPLES IV

DATE: 27/10/2020

TIME: 8.30-10.30 AM

## INSTRUCTIONS

1. You should have mathematical tables / Scientific Calculators for this Examination.
1. Take  $\mu = 2\pi \times 10^{-7}$  H/M and  $\epsilon = 8.85 \times 10^{-12}$  F/M
2. Answer Q1 and any other 2 questions
3. Neat work required

## QUESTION ONE (30 MARKS)

- a) Explain the following terms
- i. Resistance
  - ii. Capacitance
  - iii. Inductance
  - iv. Reliability
  - v. Tolerance (10 marks)
- b) Two resistors  $10\Omega$  and  $15\Omega$  are connected in parallel across a battery of 8V which has four cells in series. Each cell has an E.M.F of 2 V and an internal resistance of  $0.2\Omega$  calculate.
- i. P.D across the battery terminals
  - ii. Current through each resistor
  - iii. Total power dissipated in the Resistors
  - iv. Energy dissipated in the resistors (20 marks)

## QUESTION TWO (20 MARKS)

- a) Explain the following terms applied in capacitors
- i. Permittivity
  - ii. Dielectric
  - iii. Charge
- a) With an aid of wave forms show how a capacitor motor is used in a motor vehicle wind-screen (4 marks)
- b) A car battery is made up of cells show how charging takes place when acid is powered inside the plates (4 marks)
- c) A lamp uses 12 V, 150 W when connected to a supply voltage of 240v. Find the current consumed by the Lamp (3 marks)
- d) List ant THREE materials used as dielectrics in capacitors (3 marks)

## QUESTION THREE (20 MARKS)

- a) Explain the following terms
- i. Peak value
  - ii. R.M.S value
  - iii. Average value
  - iv. Frequency
  - v. Time period (10 marks)
- b) The instantaeous value of a sinusoidal current is given by the Expression  $i = 141.4 \sin 314t$ . Determine all the values given in Q 1(a) (10 marks)

## QUESTION FOUR (20MARKS)

- a) Define electric flux density (3 marks)
- b) A capacitor consists of two paper plates each having an area of  $0.01\text{m}^2$  spaced 0.5 mm apart. The relative permittivity of the dielectric is 2.25. If a p.d of w40v is maintained across the plates , determine
- i. Capacitance in pico farads
  - ii. Charge in micro- coulombs
  - iii. Electric flux density
  - iv. Electric field strength of the Dielectric (8 marks)
- c) Describe a two Transistor Amplifier (9 marks)

**QUESTION FIVE (20MARKS)**

- a) With an aid of labeled diagrams), explain a single-phase transformer (5 marks)
- b) Give an expression for the induced E.M.F (E) in a coil of N-turns (3 marks)
- c) A 5kva single phase Transformer has a turns ratio of 10.1 and is fed from a 2.5 kv supply. Neglecting losses determine
  - i. Full- load secondary current
  - ii. Minimum resistance which can be connected across the secondary winding to give full load KVA
  - iii. The primary current at full load KVA (12 marks)