



MACHAKOS UNIVERSITY

University Examinations for 2019/2020

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL ENGINEERING

EPC 206: ENGINEERING PRINCIPLES III

DATE: 5/12/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS

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

QUESTION ONE (30 MARKS)

- a) Explain the following terms used in engineering
 - (i) Durability
 - (ii) Tolerance
 - (iii) Transformation ratio
 - (iv) Dielectric
 - (v) Transduction(10 marks)
- b) Two resistors of value 3Ω and 5Ω are connected in
 - (i) Parallel
 - (ii) Series. Find the total resistance in each case(5 marks)
- c) The resistors in Q 1 (b) are connected to a power supply of 100V. Calculate the current supplied in each case (5 marks)
- d) Explain the following terms applied in static electricity
 - (i) Capacitance
 - (ii) Inductance

- (iii) Permittivity
- (iv) Insulation
- (v) Electric field strength (10 marks)

QUESTION TWO (20 MARKS)

- a) Two capacitors of 2μ and $4\mu\text{F}$ are connected in
 - (i) Series
 - (ii) Parallel Determine total capacitance in both case (5 marks)
- b) If both circuits in Q2(a) and connected to a power supply of 50V, 50 HZ , find the charge created in each capacitor (10 marks)
- c) Derive the expression for capacitors in series and parallel respectively (5 marks)

QUESTION THREE (20 MARKS)

- a) Briefly explain the following terms used in conduction
 - (i) Resistivity
 - (ii) Length
 - (iii) Conductivity
- b) Table 1 shows values of flux density (B) and magnetic field strength (H) obtained from an experiment . Plot the B-H curve using the values given (10 marks)

Flux Density B(Tesla)	1.0	1.2	1.3	1.35	1.42	1.45	1.5	1.55
Magnetic field strength (H)	200	450	700	1000	1500	2000	300	4500

- c) Briefly explain the following
 - (i) Hysteresis loop
 - (ii) Permeability (4 marks)

QUESTION FOUR (20 MARKS)

a)

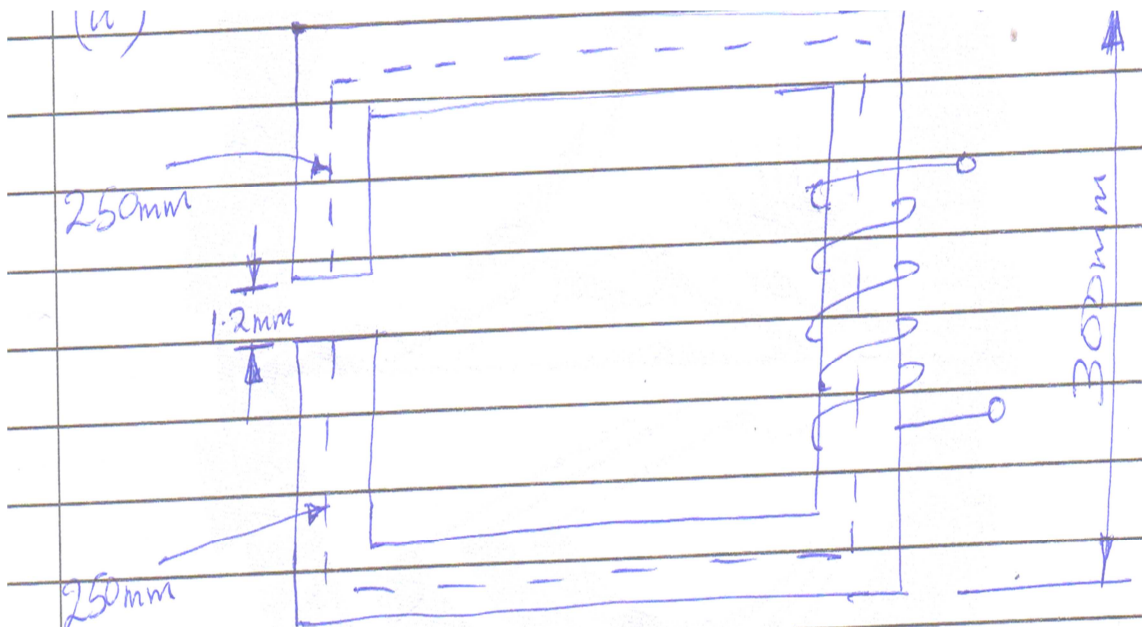


Fig.1

Figure 1
shows

configurations of a magnetic circuit . The limb has a cross – sectional area of 10 cm^2 . The air gap is 1.2 mm long . The coil has 500 twins and the flux in the air gap is $1 \times 10^{-3} \text{ wb}$ Determine

- (i) Magnetic flux density in the air – gap
 - (ii) Magnetic field strength in the air gap
 - (iii) Mmf in the air gap (12 marks)
- b) Describe the operation of a sensitive Galvanometer (5 marks)
- c) Show how the Galvanometer in Q 4 (a) is used to measure in Q 4 (a) is used to measure voltage in a circuit (3 marks)

QUESTION FIVE (20 MARKS)

- a) With an aid of labeled diagram (s) explain the operation of a single phase transformer (8 marks)
- b) A single transformer has 300 turns in the primary winding and 2000 windings in the secondary terminals. If the supply voltage is 240 V a.c , calculate the load voltage using a secondary current of 2 A . Find also the input current to the Transformer (8 marks)
- c) The transformer in Q 5 (b) is connected to a load of 12 V , 50 W . Find the resultant of output current (4 marks)