



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

MECHANICAL AND AUTOMOTIVE ENGINEERING DEPARTMENT

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MECHANICAL ENGINEERING

EMC 2601: ELECTRICAL AND ELECTRONIC PRINCIPLES II.

END OF SEMESTER EXAMINATION

SERIES: APRIL, 2025

TIME: 2 HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Attempt ANY THREE.

Do not write on the question paper.

Question ONE

- a) Define the following terms as applied in alternating current circuits
 - i. Form factor ,
 - ii. Crest value.
 - iii. A peak value.
 - iv. State the relationship of i, ii and iii (8marks)
- b) The equation for an alternating current is given by $i = 77 \sin 314t$. Find the peak value, frequency, time period and instantaneous value at $t = 2 \text{ ms}$. (6marks)
- c) Using an AC volt meter we found the AC sine wave voltage to be 10-Volts. Determine
 - i. the peak value of this voltage.
 - ii. the RMS value of this voltage.
 - iii. the peak to peak value of this voltage. (6marks)

Question TWO

- a) i. Define and represent mathematically the following terms as applied to magnetic circuits
- (I) Magnetic flux density
 - (II) Magnetic field strength
 - (III) Permeability (6marks)
- ii. State Ohm's law for magnetic circuit. (4marks)
- b) An iron ring with a cross-sectional area of 3 cm^2 and a mean circumference of 15 cm is wound with 250 turns of wire carrying a current of 0.3 A . The relative permeability of the ring is 1500.
- i. Calculate the flux established in the ring.
 - ii. If a saw cut of width 2 mm is made in the above ring, find the new value of the flux in the circuit. (8marks)
- c) Explain the term fringing in magnetic circuits. (2marks)

Question THREE

- a) Define the following terms
- i. Coercivity.
 - ii. Magnetic reluctance (4marks)
- b) With the aid of diagrams differentiate between statically and dynamically induced emf. (8marks)
- c) Fig.1 is an iron ring with a cross sectional area of 8 cm and a mean circumference of 120 cm is wound with 480 turns of wire carrying a current of 2 A . The relative permeability of the ring is 1250. Calculate the flux established in the ring. (8marks)

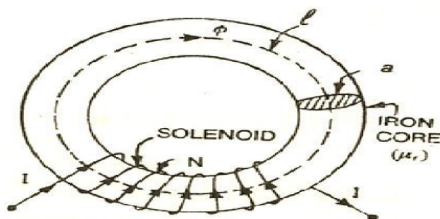
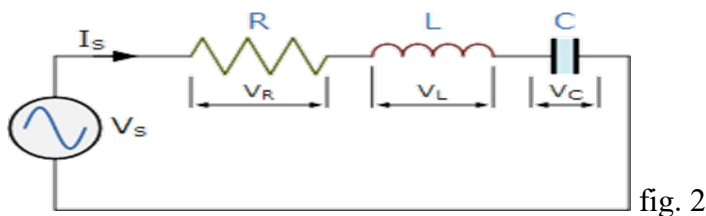


Fig.1

Question FOUR

- a) Define the term, impedance hence give the equation for a an RLC circuit (4marks)
- b) Derive the equation for the resonance of a parallel RLC circuit (6marks)
- c) Suppose a ac generator with $V(t) = 150V \sin 100\pi t$ is connected to RLC in fig. 2. where $R = 40\Omega$ $L = 185\text{mH}$ and $C = 65\mu\text{F}$. Calculate
- the maximum voltage drop across each element
 - the maximum voltage drop across the L and C
 - sketch the voltage triangle
- (6marks)
- d) Explain the term Q factor in resonance circuits stating its relationship with reactance (4marks)



e)

Question FIVE

- a) With the aid of a simplified diagram explain the operating principles of a generator.(6marks)
- b) Describe the occasion when the d.c generator would not have a residual flux (4marks)
- c) A shunt generator delivers 450 A at 230 V and the resistance of the shunt field and armature are 50Ω and 0.03Ω respectively. Calculate the generated EMF (6marks)
- d) State the conditions to be fulfilled for a shunt generator to build up voltage (4marks)