



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

EED 108: ELECTRICAL ENGINEERING PRINCIPLES II

DATE: 8/5/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS:

Answer Question one And Any Other Two Questions

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) With an aid of a labeled constructional diagram describe the components of an a.c generator. (9 marks)
- b) A coil of 250 turns is wound uniformly over a wooden ring having a mean circumference of 400mm and a uniform cross-sectional area of 1000 mm^2 . If the current through the coil is 5 A. Taking relative permeability of wood is 1 and permeability of free space is $4\pi \times 10^{-7} \text{ H/m}$. Calculate the;
- magneto motive force
 - magnetic field strength
 - flux density
 - total flux
 - reluctance (10 marks)
- c) An a.c generator has a coil of 200 turns rotated at 3600 rpm in a magnetic field having a uniform density of 0.05 T, the axis of rotation is at right angles to the direction of the flux. If the mean area per turn is 60 cm^2 . Calculate the;

- i. frequency
 - ii. periodic time
 - iii. maximum value of e.m.f generated
 - iv. generated e.m.f when the coil is rotated through 45° from the position of zero e.m.f (9 marks)
- d) State the principle of ac generator (2 marks)

QUESTION TWO (20 MARKS)

- a) i State the two Faraday's induction laws
- ii A conductor 200 mm long is carrying current of 8 A. The force on the conductor is 5N. Calculate the density of the field. (5 marks)
- b) State four characteristics of lines of magnetic flux. (4 marks)
- c) i A voltage of 240V at 50Hz is applied across a circuit consisting of a pure resistor of 15Ω connected in series with a pure inductor of 0.03H;
- I. determine the current flowing in the circuit
 - II. if the inductor is replaced with a capacitor of $100\mu\text{F}$, calculate the new value of current
- ii Define each of the following terms with respect to alternating current systems.
- I. Cycle
 - II. Phasor diagram
 - III. Form factor (11 marks)

QUESTION THREE (20 MARKS)

- a) State three conditions of an RLC series circuit at resonance frequency. (3 marks)
- b) Derive the formula for Q factor in RLC series circuit. (5 marks)
- c) A circuit consists of a resistor of 50Ω , a coil of inductance 0.2H and a $10\mu\text{F}$ capacitor connected in series. The circuit is connected to a 100 V a.c supply. For this circuit, calculate the;
- I. Resonance frequency
 - II. Supply current
 - III. Voltage across each of the three components

IV. Active power absorbed by the circuit

(12 marks)

QUESTION FOUR (20 MARKS)

- a) Draw a sinusoidal waveform and indicate the following quantities with reference to alternating systems.
- i. peak value
 - ii. Instantaneous value
 - iii. period (6 marks)
- b) An alternating voltage has an equation $V = 150 \sin 314t$. Determine for this voltage;
- i. r.m.s voltage
 - ii. average voltage
 - iii. frequency
 - iv. The instantaneous voltage when $t = 0.25$ sec (8 marks)
- c) A coil have an inductance of 0.15 H and an internal resistance of 10Ω . If it is connected across a 220 V, 50 Hz supply. Calculate the;
- i. circuit impedance
 - ii. supply current
 - iii. phase angle (6 marks)

QUESTION FIVE (20 MARKS)

- a) Draw a labeled waveform diagram for voltage and current in an RC series circuit. (6 marks)
- b) State three advantages of improving power factor in electrical engineering. (3 marks)
- c) Distinguish between ferromagnetic and paramagnetic materials with respect to magnetism. (4 marks)
- d) Derive the equation for resonance frequency in RLC series circuit. (7 marks)