



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN TELECOMMUNICATION
ENGINEERING

EPC 206: ELECTRICAL ENGINEERING PRINCIPLES III

DATE:

TIME:

INSTRUCTIONS

Attempt Question One and Any Other Two Questions

1. (a) (i) Draw a labeled waveform and phasor diagrams for an AC series resistor-inductor (R-L) circuit. (6 marks)
- (ii) A capacitor of $220\mu\text{F}$ is connected in series with a resistor of 20Ω resistor. The network is connected across a 110V, 60Hz supply. Determine
 - I. reactance of the capacitor
 - II. Circuit impedance
 - III. Supply current
 - IV. Phase angle (8 marks)
- (b) A coil of 300 turns is rotated at 3600 rpm in a magnetic field having a uniform density of 0.2 Wb/m^2 , the axis of rotation being at right angles to the direction of the flux. The mean area per turn is 100 cm^2 . Calculate the

- I. frequency
 - II. maximum value of e.m.f generated
 - III. generated e.m.f when the coil is rotated through 30° from the position of zero e.m.f (7 marks)
- (c) (i) Describe the following resistors in indicating instruments.
- I. Multiplier
 - II. Shunt (6 marks)
- (ii) State the three essential forces for correct functioning of an analogue indicating instrument. (3 marks)
2. (a) Derive the formula for resonance frequency for an RLC a.c series circuit (5 marks)
- (b) A series circuit consists of a $1\mu\text{F}$ capacitor, a coil of inductance 0.64H and a resistance of $60\ \Omega$. The circuit is connected to a 60 V a.c supply. For this circuit, calculate the;
- I. Resonance frequency
 - II. Supply current
 - III. Potential difference across the capacitor. (7 marks)
- (c) A series circuit consists of a resistance of $30\ \Omega$, a coil of inductance 0.5 H and a $100\mu\text{F}$ capacitor connected across a 240 V , 50 Hz supply. Calculate the;
- I. impedance
 - II. supply current
 - III. voltage across the inductor
 - IV. phase difference between the current and the applied voltage (8 marks)
3. (a) (i) Draw a labeled diagram of an AC generator
- (ii) Explain the principle of a.c generation. (10 marks)

- (b) (i) Define the following terms with reference to alternating systems.
- I. period
 - II. peak value (2 marks)
- (ii) An alternating voltage has an equation $v = 400 \sin 300t$. Determine for this voltage;
- I. r.m.s value
 - II. average value
 - III. frequency
 - IV. The Instantaneous voltage when $t = 0.5$ sec (8 marks)
4. (a) With an aid of a labeled construction diagram, describe the operation of a permanent magnet moving-coil instrument. (7 marks)
- (b) Draw a labeled construction diagram of repulsion-type moving iron instrument and explain its working. (7 marks)
- (c) Moving-coil instrument gives full-scale deflection with 10mA. The instrument has an internal resistance of 15Ω . Calculate the resistance required;
- I. In parallel to enable the instrument to read up to 1A
 - II. In series to enable it to read up to 10V. (6 marks)
4. (a) With the aid of labeled diagrams describe the operations of the following instrument damping methods;
- i. Air
 - ii. Gravity control (12 marks)
- (b) Draw a labeled waveform and phasor diagrams for an AC series resistor-inductor-capacitor (R-L-C) circuit. (8 marks)