



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION DIPLOMA IN ELECTRICAL
ENGINEERING

EED 108: ELECTRICAL ENGINEERING PRINCIPLES

DATE: 15/12/2017

TIME: 2.00-4.00 PM

INSTRUCTIONS:

Attempt Question One And Any Other Two Questions

1. (a) A coil have an inductance of 0.1 H and an internal resistance of $10\ \Omega$ if it is connected across a 240 V, 50 Hz supply. Calculate the;
 - i) circuit impedance
 - ii) supply current
 - iii) phase angle
 - iv) circuit power factor (11 marks)
- (b) With an aid of a labeled diagram explain the principle of a.c generation. (9 marks)
- (c) Derive the equation for resonance frequency in RLC series circuit. (10 marks)
2. (a) State three conditions of an RLC series circuit at resonance frequency. (3 marks)

- (b) A series circuit consists of a resistance of $47\ \Omega$, a coil of inductance 0.3H and a $1\mu\text{F}$ capacitor. The circuit is connected to a 50 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)
- (c) Derive the formula for Q factor in RLC series circuit. (5 marks)
3. (a) Draw a sinusoidal waveform and indicate the following terms with reference to alternating systems.
- i) peak value
 - ii) Instantaneous value
 - iii) period (6 marks)
- (b) A simple a.c generator has a coil of 200 turns rotated at 3600 rpm in a magnetic field having a uniform density of 0.1 T , the axis of rotation is at right angles to the direction of the flux. If the mean area per turn is 80 cm^2 . Calculate the;
- i) frequency
 - ii) maximum value of e.m.f generated
 - ii) generated e.m.f when the coil is rotated through 30° from the position of zero e.m.f (6 marks)
- (c) An alternating voltage has an equation $V = 100 \sin 314t$. Determine for this voltage;
- i) r.m.s voltage
 - ii) average voltage
 - iii) frequency
 - iv) The instantaneous voltage when $t = 0.3\text{ sec}$ (8 marks)

4. (a) Draw a labeled waveform diagram for voltage and current in RC series circuit. (6 marks)
- (b) Describe three advantages of improving power factor in electrical engineering . (6 marks)
- (c) Derive the emf equation of a single phase AC generator (8 marks)
5. (a) Define the following with reference to sinusoidal waveforms;
- i) RMS value
- ii) form factor (4 marks)
- (b) 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 (8 marks)
- (c) Explain each of the following terms wrt alternating current.
- i) Cycle
- ii) phasor diagram
- iii) Amplitude
- iv) Frequency (8 marks)