MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

EED 108: ELECTRICAL ENGINEERING PRINCIPLES II

DATE: 6/6/2017 **TIME: 2:00 – 4:00 PM**

INSTRUCTIONS

Answer Question One and Any Other Two Questions

1. (a) State three conditions of an RLC circuit at resonance frequency (3 marks)

(b) With an aid of a labeled constructional diagram of an a.c generator explain its principle of operation. (9 marks)

(c) A circuit has a resistance of 15 Ω connected in series with a coil having an inductance of 0.1 H is connected across a 110 V, 60 Hz supply. Calculate the;

I. reactance of the coil
II. circuit impedance
III. supply current
IV. phase difference between the current and the applied voltage (13 marks)

(d) Two coils are connected in series and their effective inductance is found to be 20 H. After the connection of one of the coils is reversed, the effective inductance is 8 H. if the coefficient of coupling is 0.7, calculate the;

I. self inductance of each coil

II. mutual inductance (5 marks)

2. (a) A coil of 400 turns is rotated at 2400 rpm in a magnetic field having a uniform density of 0.2 T, 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 30^0 from the position of zero e.m.f (7 marks)

(b) A series circuit consists of a 1μF capacitor , a coil of inductance 0.64H and a resistance of 60 Ω. 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 each of the three components
IV. Active power absorbed by the circuit (13 marks)

3. (a) Define the following terms with reference to alternating systems.

I. frequecy

II. peak value

III. Instantaneous value (3 marks)

(b) An alternating voltage has an equation v = 100 sin 250t. Determine for this voltage;

I. frequency

II. r.m.s voltage

III. average voltage

IV. The Instantaneous voltage when t = 0.6 sec (11 marks)

(c) With an aid of a labeled circuit diagram state expression for Delta-Star transformation in 3-phase systems. (6 marks)

4. (a) State three areas of applications of inductance. (3 marks)

(b) State the physical factors determining the inductance of a coil and hence write the expression for inductance. (4 marks)

(c) If the current through a coil having an inductance of 0.6H is reduced from 5A to 3A in 0.05 seconds, calculate the value of induced emf in the coil. (6 marks)

(d) A coil having a resistance of 10Ω and a constant inductance of 2 H is switched across a 12 V d.c supply. Calculate the;

I. time constant

II. final value of the current

III. value of the current 1 sec after the switch is closed. (7 marks)

5. (a) Draw a labelled phasor diagram for RLC series circuit. (6 marks)

(b) A coil of 200 turns is rotated at 3600 rpm in a magnetic field having a uniform density of 0.1 T, the axis of rotation being at right angles to the direction of the flux. The mean area per turn is 75 $cm^{2.}$ Calculate the

I. frequency

II. maximum value of e.m.f generated

III. generated e.m.f when the coil is rotated through 30^0 from the position of zero e.m.f (7 marks)

(c) A coil having a resistance of 6Ω and an inductance of 0.03 H is connected across a 50 V,60Hz supply. Calculate the;

I. supply current

II. apparent power

III. active power (7 marks)