TECHNICAL UNIVERSITY OF MOMBASA

FACUULTY OF ENGINEERING AND TECHNOLOGY

ELECTRICAL ENGINEERING DEPARTRMENT

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONIC ENGINEERING

EEE2208: CIRCUIT AND NETWORK THEORY I

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: Pick DateSelect MonthPick 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; Question ONE is compulsory. In addition attempt any Other TWO Questions.

Do not write on the question paper.

QUESTION ONE (30 marks)

(a) Define the following terms in relation to sinusoidal current wave

(i) average value (1 mark)

(ii) Peak value (1 mark)

(iii) Root mean square value (2 marks)

(b) For a sinusoidal voltage waveform defined by the following expression $v(t) = V_m \sin(\omega t + \theta)$, where v(t) is the instantaneous voltage value, V_m - maximum voltage, t - time, ω - angular velocity and θ - is the phase shift of the waveform, prove, from first principles, that the effective value, V is equal to $\frac{V_m}{\sqrt{2}}$. (10 marks)

(c) For the circuit in figure 1, the following data is given: $\overline{E}_1 = 250\angle 0^0$ V, $\overline{E}_2 = 250\angle -120^0$ V, $\overline{E}_3 = 250\angle 120^0$ V, R=50 Ω. Step by step, determine

(i) currents I_1, I_2, I_3 and I_4

(ii) determine the readings of voltmeters V1 and V2

(16 marks)

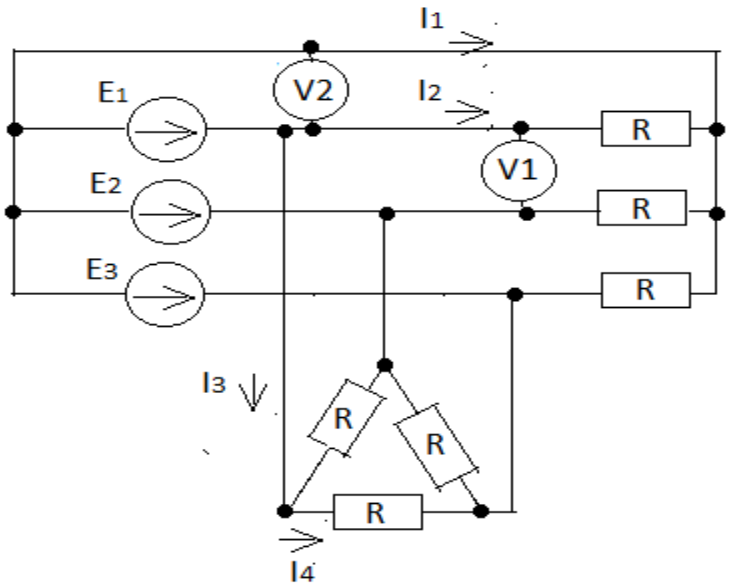

Figure Q1

QUESTION TWO (20 marks)

(a) Define the following terms in relation to electrical circuits

(i) impedance

(ii) admittance

(iii) apparent power

(iv) susceptance

(4 marks)

(b) For the given Figure 2, the following data is given: E = 120 V, R_1 =10 Ω, L = 10 mH, R_2 = 5Ω and C = 100 μF. Determine

(i) the frequency at which current I will be maximum

(ii) the maximum current

(iii) reactive power given by the source at frequency found in (i)

(iv) reactive power consumed by the inductor at frequency 50 Hz

(iv) the reactive power consumed by the inductor at the frequency found in (i)

(16 marks)

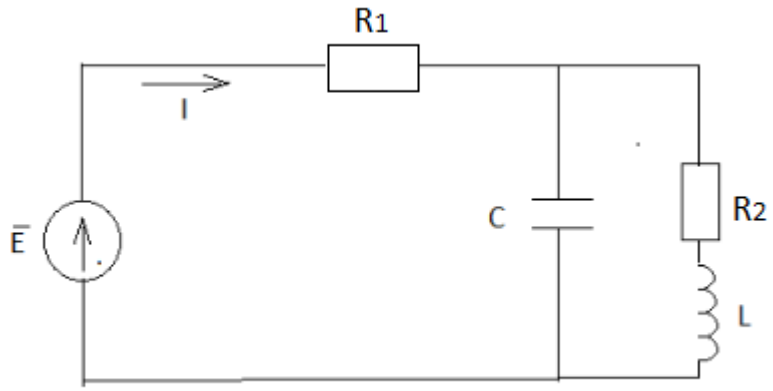

Figure 2

QUESTION THREE (20 marks)

(a) Define the following terms

(i) Resonance

(ii) Selectivity

(4 marks)

(b) For the diagram given in Figure 3, the following data is given: $\overline{E} = 240 + j0V$, R = 10 Ω, and 100 mH. Determine:

(i) the capacitance C that will ensure that the source supplies power at power factor 1

(ii) the power supplied by the source with C in part (i) is in place

(iii) the difference in current I when capacitor is in place and when the branch with capacitance is removed.

(16 marks)

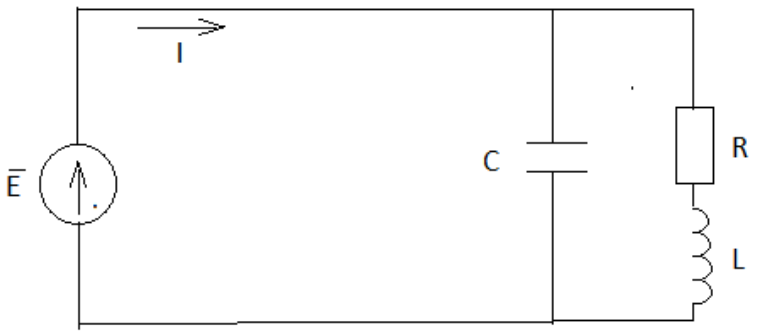

Figure 3

QUESTION FOUR (20 marks)

(a) Define the following terms

(i) apparent power

(ii) reactive power

(ii) power factor correction

(3 marks)

(b) For the circuit in Figure Q4, the following data is given: E=100 V, R = 50Ω and C = 500 μF, initial charge on the capacitor is zero. Determine:

(i) the equation that will describe the voltage across the capacitor with time, $v_C(t)$

(ii) the equation that describes the voltage across the resistor against time, $v_R(t)$

(iii) the current in the circuit against time, i(t)

(iv) sketch the three curves $v_C(t)$, $v_R(t)$ and i(t)

(v) determine the time t when $v_C(t)$ will reach 50 V

(17 marks)

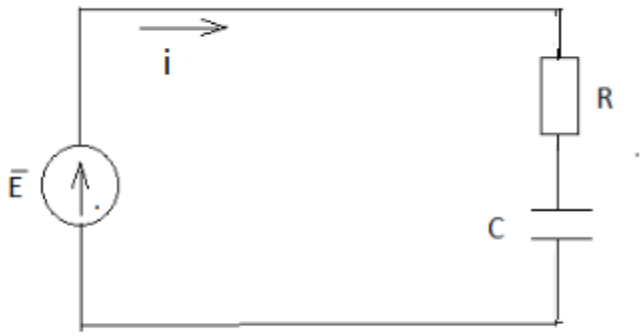

Figure 4

QUESTION FIVE

(a) Define the following terms

(i) Step response,

(ii) rise time,

(iii) impulse response

(6 marks)

(b) In the circuit in Figure 5, the following data is given: E = 200V, R = 100 Ω and L =10 H. The switch S is closed and the circuit parameters are at their steady state. At time t=0, the switch is suddenly opened.

(i) determine time depedent current through the inductor L

(ii) sketch the current against time of the current through the inductor L

(ii) dtermine the time taken for the current to be 1 A. (14 marks)

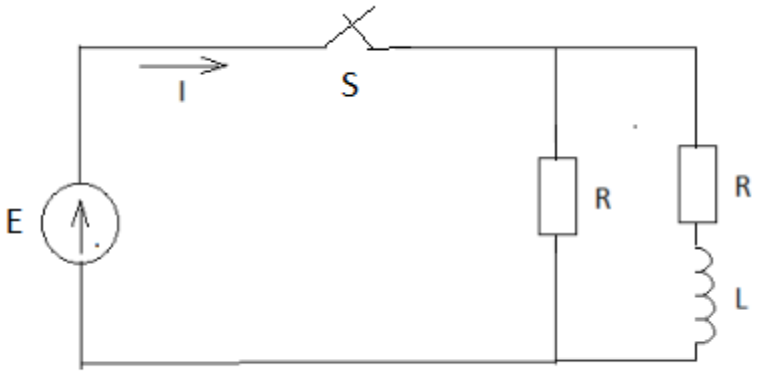

Figure 5