KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

ECV 211: ELECTRICAL ENGINEERING

DATE: THURSDAY, 19TH APRIL 2012 **TIME: 11.00 A.M. – 1.00 P.M.**

INSTRUCTIONS:

(i) There are **Five** questions.

(ii) Question No.1 is **Compulsory** and carries **30 Marks.**

(iii) Select any **other Two** questions, each of which carries 20 Marks.

(iv) Define all symbols used .

(v) Marks will be awarded for procedure, methodologies used and not necessarily on the final answer.

Q1. (a) (i) Determine the resistance of a copper wire which is 500m long and has a diameter of 1.5 mm. Take resistivity for copper as 1.732×10^{-8} Ω-m. (4 MARKS)

(ii) State Joule's Law and give its application. (3 MARKS)

(iii) Determine the equivalent inductances for each of the two circuits depicted in Fig.Q1a. (3 MARKS)

(b) (i) For a given R-C circuit, distinguish between *zero-state response* and *zero-input response*. (4 MARKS)

(ii) Explain the concept of Power Triangle in sinusoidal steady state systems. (3 MARKS)

(iii) From first principles, show that the impedance of a Capacitor of capacitance c farads, through which a sinusoidal current of frequency ω radians is flowing is $1/j\omega c$ *ohms.* (3 MARKS)

(c) (i) Indicate what Mutual Inductance is. (3 MARKS)

(ii) The driving point impedance (Z) of the circuit given in Fig.Q1c is 1Ω. Determine Z_x. (4 MARKS)

(iii) Draw the Phasor diagram for a Star connected balanced *Source* supplying a Delta connected balanced *Load*, power factor Cos φ. (3 MARKS)

Q2. The Switch S in the circuit given in Fig.Q2 is opened at $t=0$, having been closed long enough for the circuit to attain steady state.

(i) Re-draw the circuit with equivalent capacitance and resistance. (6 MARKS)

(ii) Find $v(t)$ for $t>0$. (14 MARKS)

Q3 Consider the circuit given in Fig. Q3.

(i) Draw the vector diagram of the source voltage, V. (3 MARKS)

(ii) Find the current flowing in the impedance $(3+j4)\Omega$. (14 MARKS)

(iii) Draw the vector diagram for the current in (ii) abave. (3 MARKS)

Q4. (a) (i) Draw *phasor* diagrams for resistive, inductive and capacitive loads. (6 MARKS)

(ii) Clarify the phase status of each category. (4 MARKS)

(b) Given balanced 3-phase star and delta loads, use suitable diagrams to indicate their respective configuration for:-

(i) Line and phase voltage. (5 MARKS)

(ii) Line and phase current. (5 MARKS)

Q5. (a) Demonstrate thorough understanding of:-

(i) Capacitance. (3 MARKS)

(ii) Magnetic Leakage. (3 MARKS)

(iii) Magnetic Fringing. (3 MARKS)

(b) (i) Define Electrostatic Field Intensity. (3 MARKS)

(ii) State Gauss' Law. (2 MARKS)

(iii) Show what Mutual Inductance is. (6 MARKS)

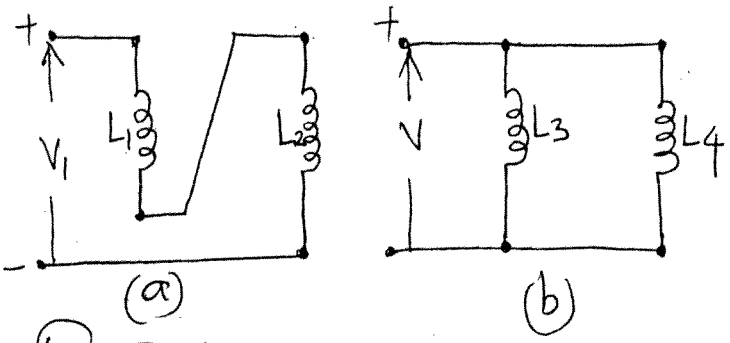

fig Q1a.

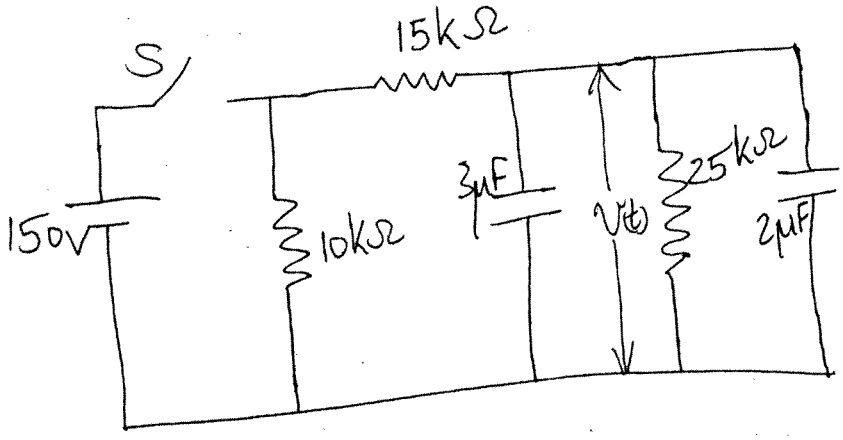

fig Q2.

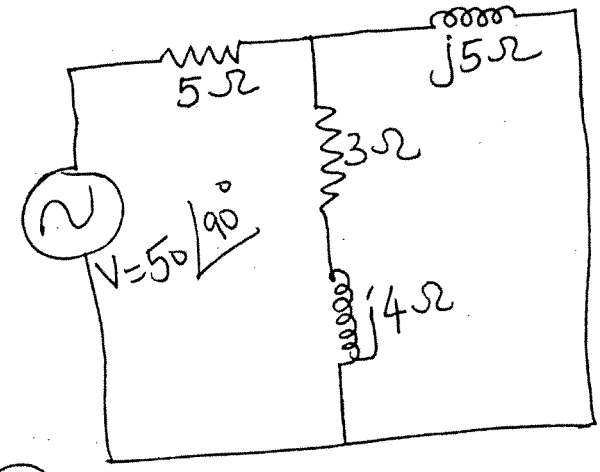

fig Q3.

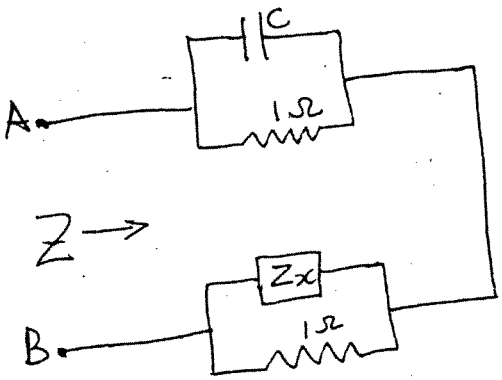

fig Q1c.