KENYA METHODIST UNIVERSITY

END OF 2ND TRIMESTER 2010 EXAMINATIONS

FACULTY   :   SCIENCE AND TECHNOLOGY
DEPARTMENT   :   COMPUTER SCIENCE & BUSINESS INFORMATION
UNIT CODE   :   PHYS 201
UNIT TITLE   :   ELECTRICAL CIRCUITS
TIME   :   2 HOURS

Instructions:

- *Question 1 is compulsory AND any other 2 questions.*

Question 1

a. Briefly discuss the following;
    i.   Kirchoffs law   (4mks)
    ii. Nortons theorem.   (4mks)

b. Define the following terms as used to AC circuits.
    i.   Amplitude   `
    ii. Cycle
                                                                     (4mks)
c. With the aid a well labeled diagram differentiate between first and second
   order circuits.   (3mks)
d. State three applications of a transformer.   (3mks)
e. Three phasors are given as A= 3+j3 , B=4 and C=5+j.Present operations AC
   in rectangular form;   (2mks)

Question 2

a. What's is a series A.C circuit   [2marks]
b. A coil has a resistance of R=5Ω and an inductance of L=100mH. At a
   particular instant in time after a battery is connected across the coil, the
   current is i=2A, and is increasing at a rate of di/dt=20As^{-1}. What is the voltage
   V of the battery? What is the time-constant of the circuit? What is the final
   value of the current?   [7marks]
c. With a relevant diagram, derive the differential equation of a series RL circuit
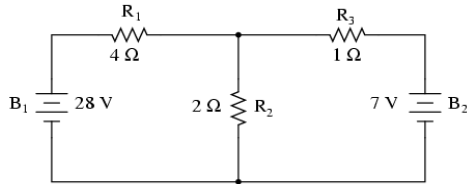   [6marks]

Question 3
a. Define the following forms in relation to DC circuits.
        i.   Node   [1marks]
        ii. Branch   [1marks]
        iii. Loop   [1marks]
b. A current of i(t)=12 $\sqrt{2cos}$ (1000t +90^0) flows through a circuit composed of a
   resistor R=18Ω and a capacitor C=83.3X10^{-6}F and a inductor L=30*M*h
   connected in series. Find the resulting voltage across all three elements.

i. Express i(t) in phasor; i=12∟90⁰ [4marks]
ii. Find the impedance for the (□=1000) [4marks]
c. An alternating current is given by *i=120sin120πt.find,*
   i. Maximum value [1marks]
   ii. Time period [2marks]
   iii. Instantaneous value when t=1/360 seconds [2marks]

Question 4

Find the currents and voltages across each resistor using the Superposition Theorem.

[20marks]

Question 5

a. What is phase sequence in three-phase system [4marks]
b. Differentiate between a step-down and step up transformer. [4marks]
c. Draw a circuit showing the three windings of a three –phase alternator interconnected in a star connection. [5marks]
d. In a RLC series circuit, show that $Z = \sqrt{R^2+X^2_C+X^2_L}$ [7marks]