University Examinations 2012/2013

SECOND YEAR, SECOND SEMESTER, EXAMINATION FOR THE DEGREE OF BACHELOR
OF SCIENCE IN INFORMATION TECHNOLOGY

ICS 2200: ELECTRONICS

DATE: DECEMBER 2012   **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question* ***one*** *and any other* ***two*** *questions*

QUESTION ONE – 30 MARKS

a. State four phases followed during the design of an electrical system. (4 Marks)
b. Giving an example for each, briefly explain the difference between metals, insulators and semi-conductors. (6 Marks)
c. Give the definition of electric current *i*, voltage *v* and power *p* and show that *p=vi*. (6 Marks)
d. Briefly differentiate between an ideal voltage source and an ideal current source. (4 Marks)
e. A potential difference of 12v is applied to a 7.5Ω resistor for a period of 5 seconds. Calculate the electric charge transferred in this time. (4 Marks)

QUESTION TWO – 20 MARKS

a. Given a formulation for each of the following: (4 Marks)
   i. Kirchoff's current law
   ii. Kirchoff's voltage law
b. What is an "ideal basic circuit element"? (3 Marks)
c. A circuit consisting of three resistances 12Ω, 16Ω and 48Ω respectively, joined in parallel is connected in series with a fourth resistance. The whole circuit is supplied at 60v and it is found that the power dissipated in the 12Ω resistance is 36w. Determine the value of the fourth resistance and the total power dissipated by the circuit. (13 Marks)

QUESTION THREE – 20 MARKS

a. A capacitor made of two conductors separated by an insulator has its capacitance equal to C. Show that the energy stored in the capacitor when the potential difference is increased from 0 to v is $\frac{1}{2}cv^2$.

(5 Marks)

b. Suppose the voltage applied across a series combination of two capacitors C_1 and C_2 is changed by Δv. Derive expression for change in voltage across C_2. (5 Marks)

c. What is the value of the e.m.f induced in a circuit having an inductance of 700µH when the current varies at a rate of 5000A/s? (3 Marks)

d. How large must inductor Lx be in order to provide a total inductance of 2.5H in this network of inductors? (7 Marks)

QUESTION FOUR – 20 MARKS

a. For a series RLC circuit determine an expression for its: (12 Marks)
    i.   Impedance Z
    ii. Resonance frequency *fo* and
    iii. Power factor

b. A series RLC circuit has R=100Ω resistance and impedance of 300Ω
    i.   What is the power factor? (3 Marks)
    ii. If the rms current is 200mA, what is the power dissipated by the circuit? (5 Marks)

QUESTION FIVE – 20 MARKS

a. What is meant by biasing PN junction? Briefly explain types of biasing. (8 Marks)
b. Explain the structure and principle of operation of a silicon controlled rectifier (SCR) (8 Marks)
c. Briefly explain what a thyristor is and its application. (4 Marks)