STAMFORD COLLEGE

SCHOOL OF ENGINEERING

FOUNDATION STUDIES IN ENGINEERING (ELECTRICAL AND ELECTRONIC)

KE009: Electric Circuits

Date : 6th Sep 2007 (Thursday)
Time : 10.00 am – 12.00 am **Duration: 2 hours + 10 minutes reading time**

Instructions to Candidates

1. SIX questions set.
2. Answer any FOUR questions.
3. All questions carry equal marks.
4. Maximum marks attainable: 100

Please ensure that this examination paper contains SIX questions on SIX printed pages before you start the examination.

Books, papers and other written materials are not allowed to be brought into the examination hall. A candidate who violates the examination rules of Stamford College or commits a malpractice will be disqualified from the examination.

Write your Examination Index Number on each page of your answer booklet.

Answer any FOUR questions.

Question 1

a) Define the following terms:

i) Current
ii) Power

(4 marks)

b) Calculate the amount of electrons passing through a fixed point in a 100 W bulb in one hour if the applied voltage is 120 V.

(6 marks)

c) The resistance of a 200 m long copper wire is 21 Ω and its thickness is 0.44 mm. Calculate its specific resistance.

(5 marks)

d) A potentiometer of resistance 80 Ω is connected across a supply of 120 V as shown in Figure Q1(a). A current of 2 A is required in the 10 Ω resistor.

i) Calculate the resistance between points A and B
ii) Find the position of the tapping point C.

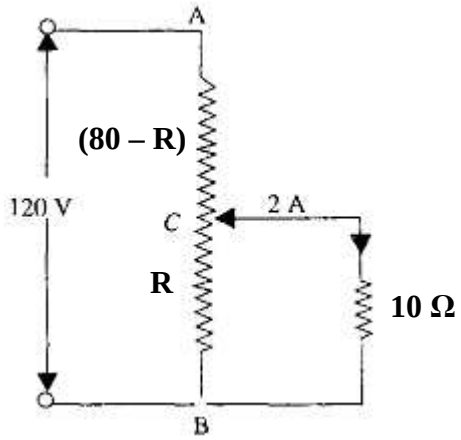

Figure Q1(a)

(10 marks)
(Total = 25 marks)

Question 2

a) State Ohm's Law.

(2 marks)

b) Three resistors of 2 Ω, 1 Ω and 5 Ω are connected in series with a 20 V supply as shown in Figure Q2(b). Calculate:

i) the total resistance
ii) the total current
iii) the potential difference across each resistor
iv) the power

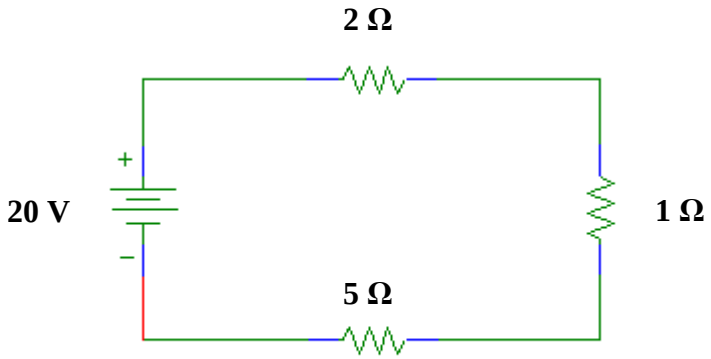

Figure Q2(b)

(7 marks)

c) For the parallel circuit shown in Figure Q2(c), calculate:

i) the equivalent resistance
ii) the current in each branches
iii) the total current

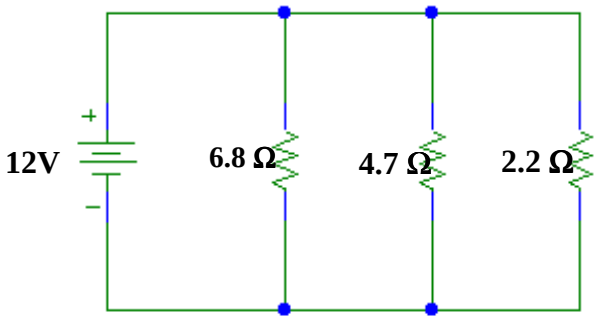

Figure Q2(c)

(10 marks)

e) For the circuit shown in Figure Q2 (d), calculate the total power (P) supplied by the 12 V battery.

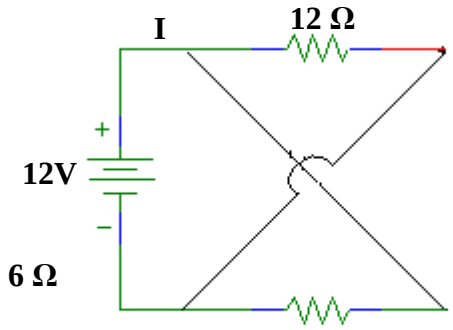

Figure Q2(d)

(6 marks)
(Total = 25 marks)

Question 3

a) State Kirchhoff's Voltage Law and Kirchhoff's Current Law.

(5 marks)

b) A wheatstone bridge network is shown in Figure Q3(b): Resistances between AB, BC, CD, DA and BD are 40,20,10,20 and 30 Ω respectively. A 2 V battery of negligible internal resistance is connected between A and C. Determine the current flowing through the 50 Ω resistor.

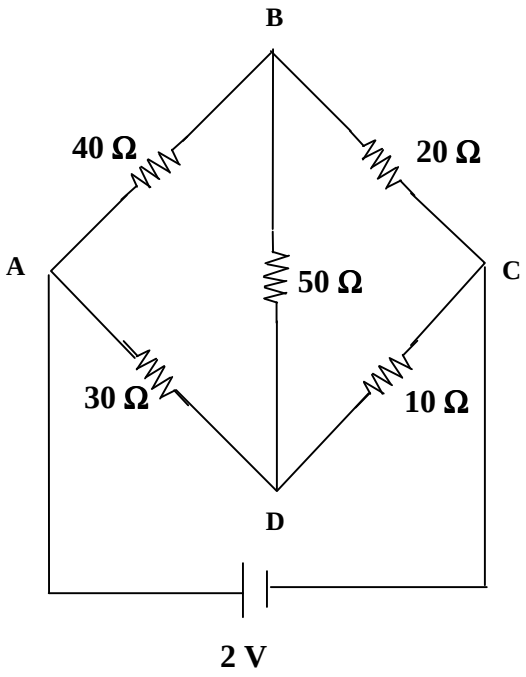

Figure Q3 (b)

(10 marks)

c) Formulate the Kirchhoff's voltage law equation for the circuit shown in Figure Q3(c) and determine the current flowing through the132 Ω resistor.

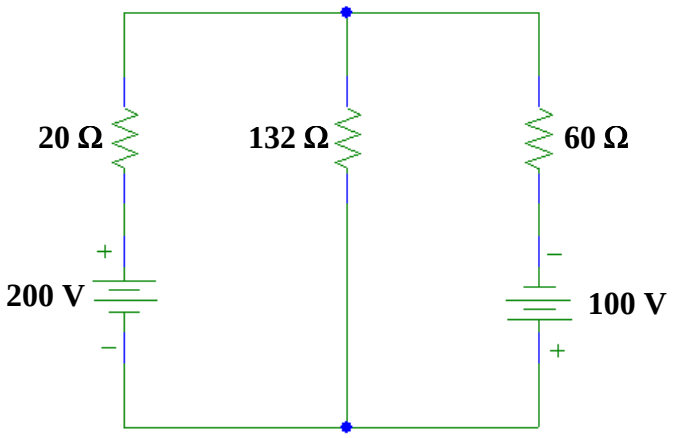

Figure Q3(c)

(10 marks)
(Total= 25 marks)

Question 4

a) A coil of 100 turns has an inductance of 0.15 H. Calculate :

i) the total magnetic flux through the coil when the current is 4 A
ii) the energy stored in the magnetic field
iii) the voltage induced in the coil when the current is reduced to zero in 0.01 second.

(6 marks)

b) Find the equivalent inductance for the circuit of Figure Q 4(a)

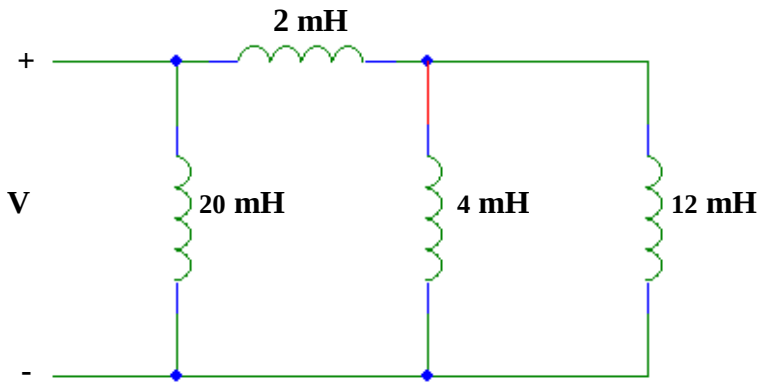

Figure Q4 (a)

(5 marks)

c) A capacitor of capacitance 4 μF is fully charged from a 12 V d.c. supply. Calculate:

i) the charge stored by the capacitor
ii) the energy delivered by the supply
iii) the energy stored by the capacitor

(6 marks)

d) A 2 μF, 3 μF and 6 μF capacitors are connected in series to a 500 V source. Calculate:

i) the equivalent capacitance
ii) the charge across each capacitor
iii) the potential difference across each capacitor

(8 marks)
(Total=25 marks)

Question 5

a) Define the following:

i) root mean square(r.m.s) value
ii) Form Factor

(4 marks)

b) An e.m.f given by the expression $v(t) = 200\sin\omega t$ is applied to a 25 Ω resistor. Determine:

i) the instantaneous current
ii) the instantaneous power
iii)the average power

(6 marks)

c) A sinusoidal alternating voltage of 50 Hz has an r.m.s value of 200 V.

i) Write an equation for instantaneous value of voltage.
ii) Draw the waveform and mark the values.

(5 marks)

d) A 200 μF capacitor is connected to a 200 V,50 Hz supply.

i) Calculate the capacitive reactance.
ii) Write an equation for instantaneous value of voltage
iii) Calculate the r.m.s value of current
iv) Calculate the instantaneous power
v) Determine the average power.

(10 marks)
(Total= 25 marks)

Question 6

a) A coil of resistance of 10 Ω and an inductance of 0.1 H is connected in series with a capacitor of 150 μF across a 200 V,50 Hz supply. Calculate:

i) the impedance
ii) the current
iii) the power factor
iv) the voltage across the coil and
v) the voltage across the capacitor

(10 marks)

b) An a.c series circuit has a resistance of 10 Ω, an inductance of 0.2 H and a capacitance of 60 μF. If the applied input voltage is 200 V, calculate:

i) the resonant frequency
ii) the current and
iii) the power at resonance

(7 marks)

c) Compare series and parallel resonance circuits.

(8 marks)
(Total = 25 marks)

– END OF PAPER –