University of Asia Pacific

Department of Civil Engineering

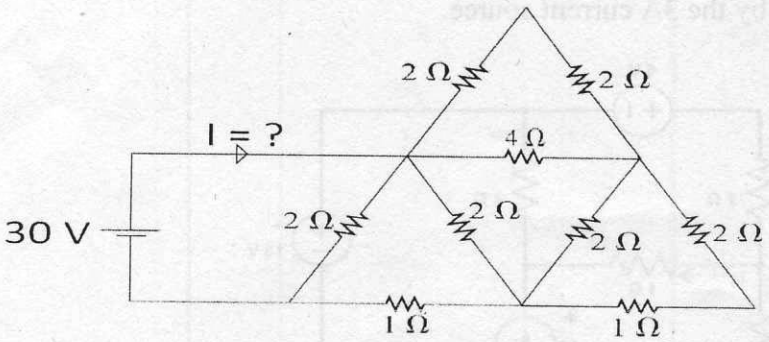
Semester Final Examination, Spring-2013

Program: B. Sc Engineering (2nd Year / 1st Semester)

Course Title: Basic Electrical Engineering Course No. ECE 201 Credits: 3.00
Time: 3.00 Hours. Full Marks: 150

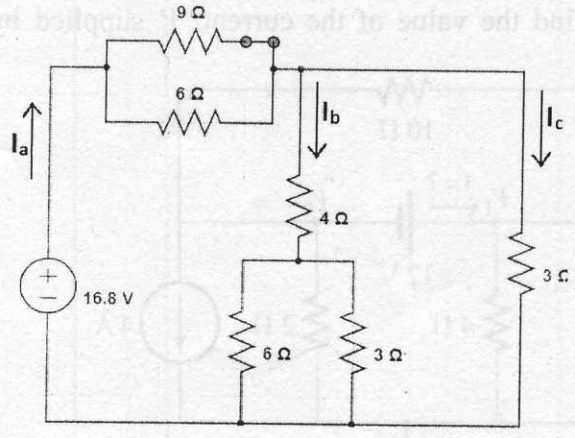
There are **Eight** Questions. Answer any **Six**. Figures in the right margin indicate marks.

01. (a) Determine the equivalent resistance seen by the 30 V source in the circuit shown below. Also determine the current 'I' supplied by the 30 V source. (7)



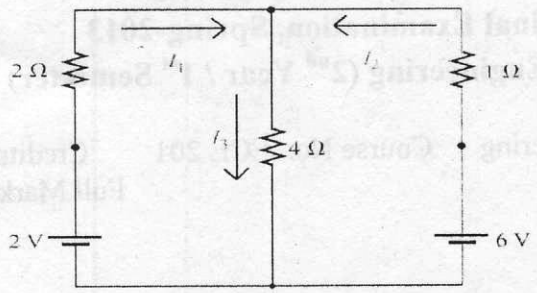
Circuit diagram for question 1(a)

(b) Find the currents I_a, I_b and I_c for the figure shown below. (9)



Circuit diagram for question 1(b)

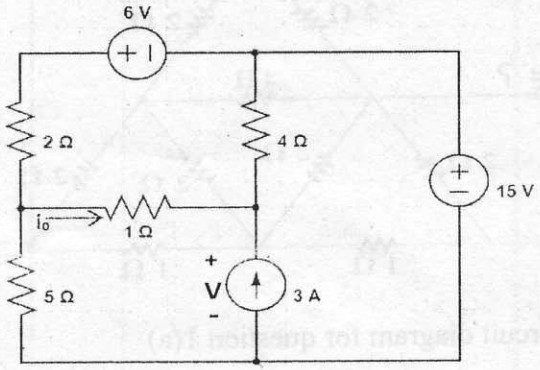
(c) Apply branch current analysis method to determine the currents I_1, I_2 and I_3 for the circuit shown below. (9)



Circuit diagram for question 1(c)

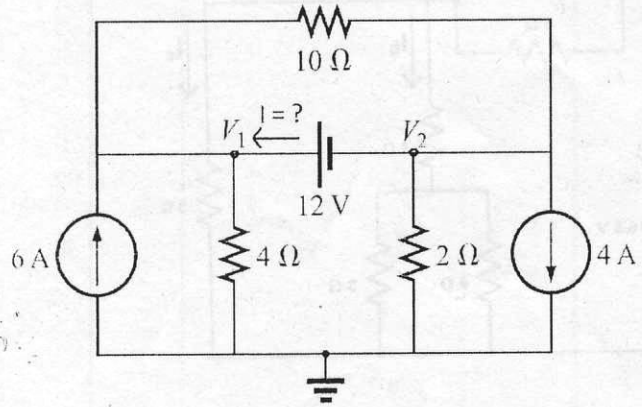
02. (a) Explain Ohm's law and Kirchoff's current law. (5)

(b) For the circuit shown below find the value of current i_0 and the voltage 'V' of the 3A current source using Superposition theorem. Also find the value of power generating / absorbing by the 3A current source. (20)



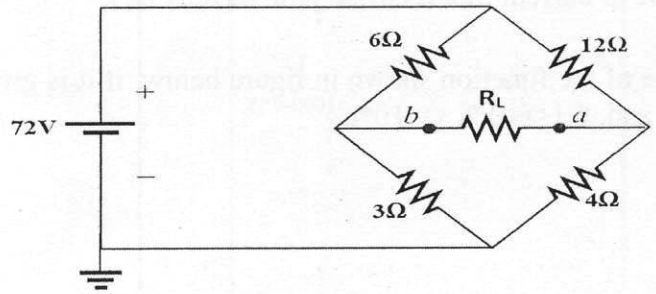
Circuit diagram for question 2(b)

03. (a) Determine the Nodal voltages V_1 and V_2 using the concept of super node, for the circuit shown below. Also find the value of the current 'I' supplied by the 12 V source. (12)



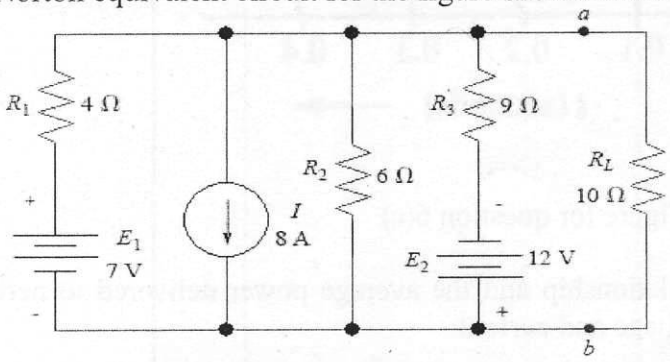
Circuit diagram for question 3(a)

(b) For the circuit shown below, find the Thevenin circuit seen by the R_L between points 'a' and 'b'. Then determine the value of R_L, so that maximum power can be transferred through R_L. Also determine the value of maximum power (13)



Circuit diagram for question 3(b)

04. (a) Find the Norton equivalent circuit for the figure shown below. (13)



Circuit diagram for question 4(a)

(b) Briefly discuss the following terms: (6*2)

Frequency, Time period, Power factor, Amplitude factor, Lenz's law, Fleming's Left Hand Rule.

05. (a) Describe the hysteresis loop of a ferromagnetic material. Explain it with a B-H curve. (13)

(b) For the magnetic circuit given below: (12)

(I) Find the value of I required to develop a magnetic flux of $2*10^{-4}$ Wb.
(II) Determine μ and μ_r for the material under these conditions.

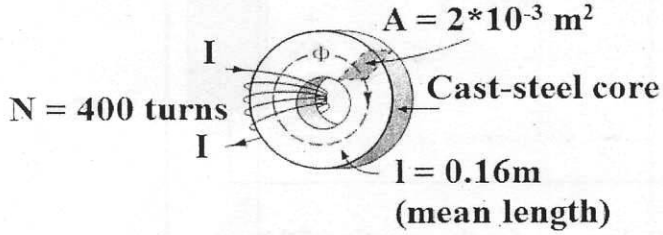


Figure for question 5(b)

06. (a) For an AC current $I = I_m \sin(\omega t)$, prove that, its r.m.s value is $I_{r.m.s} = I_m/(\sqrt{2}) = 0.707 * I_m$. (11)

(b) Prove that, average value of current of a rectified half wave is I_m/π. (7)

(c) Calculate the r.m.s value of the function shown in figure below, if it is given that for $0<t<0.1$, $y = 10(1-e^{-200t})$ and, $0.1<t<0.2$, $y = 10*e^{-100(t-0.1)}$. (7)

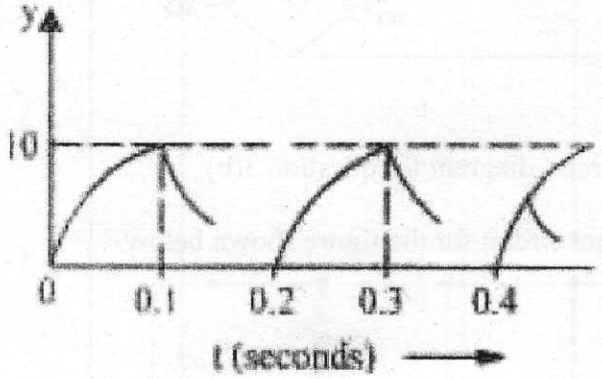


Figure for question 6(c)

07. (a) Determine the phase relationship and the average power delivered to networks having the following i/p voltage and current. (5*3)

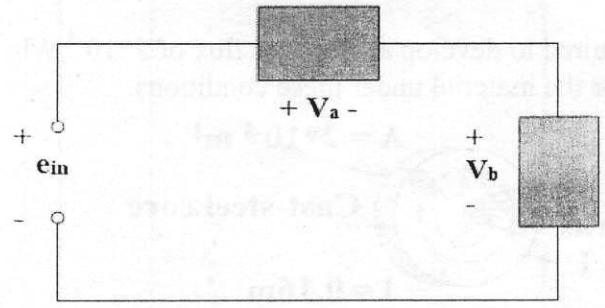
I) $v = 100\sin(\omega t+40^\circ)$, $i = 20\sin(\omega t+70^\circ)$

II) $v = 2\sin(\omega t+10^\circ)$, $i = -\sin(\omega t+30^\circ)$

III) $v = 3\sin(\omega t-150^\circ)$, $i = -2\cos(\omega t-60^\circ)$

(b) Find the input voltage of the circuit given below. If: (10)

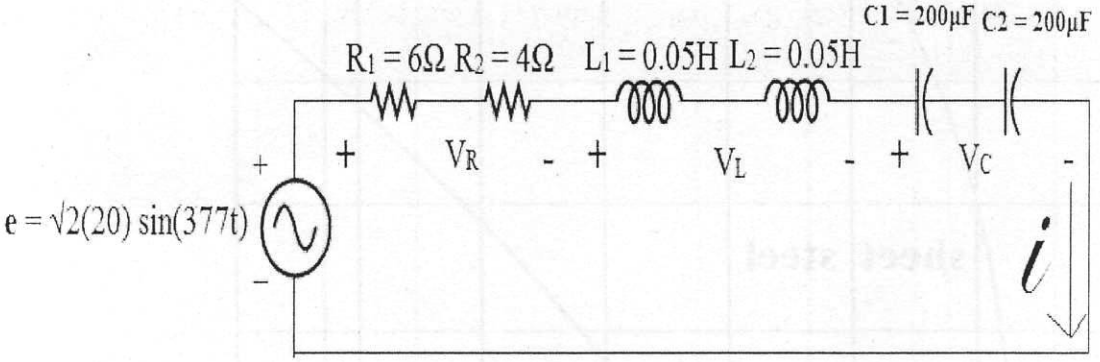
$v_a = 20 \sin(377t + 70°)$
$v_b = 30 \sin(377t + 45°)$



Circuit diagram for the question 7(b)

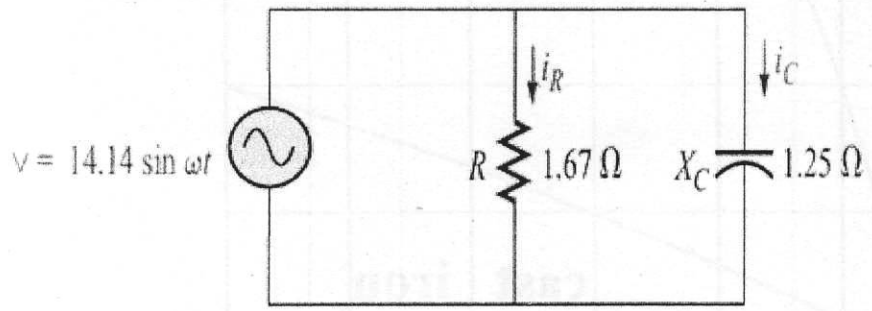
08. (a) For the circuit given below: (13)

(I) Calculate I, V_R, V_L and V_C in phasor form.
(II) Calculate the total power factor of the source.
(III) Calculate the total average power delivered by the source.

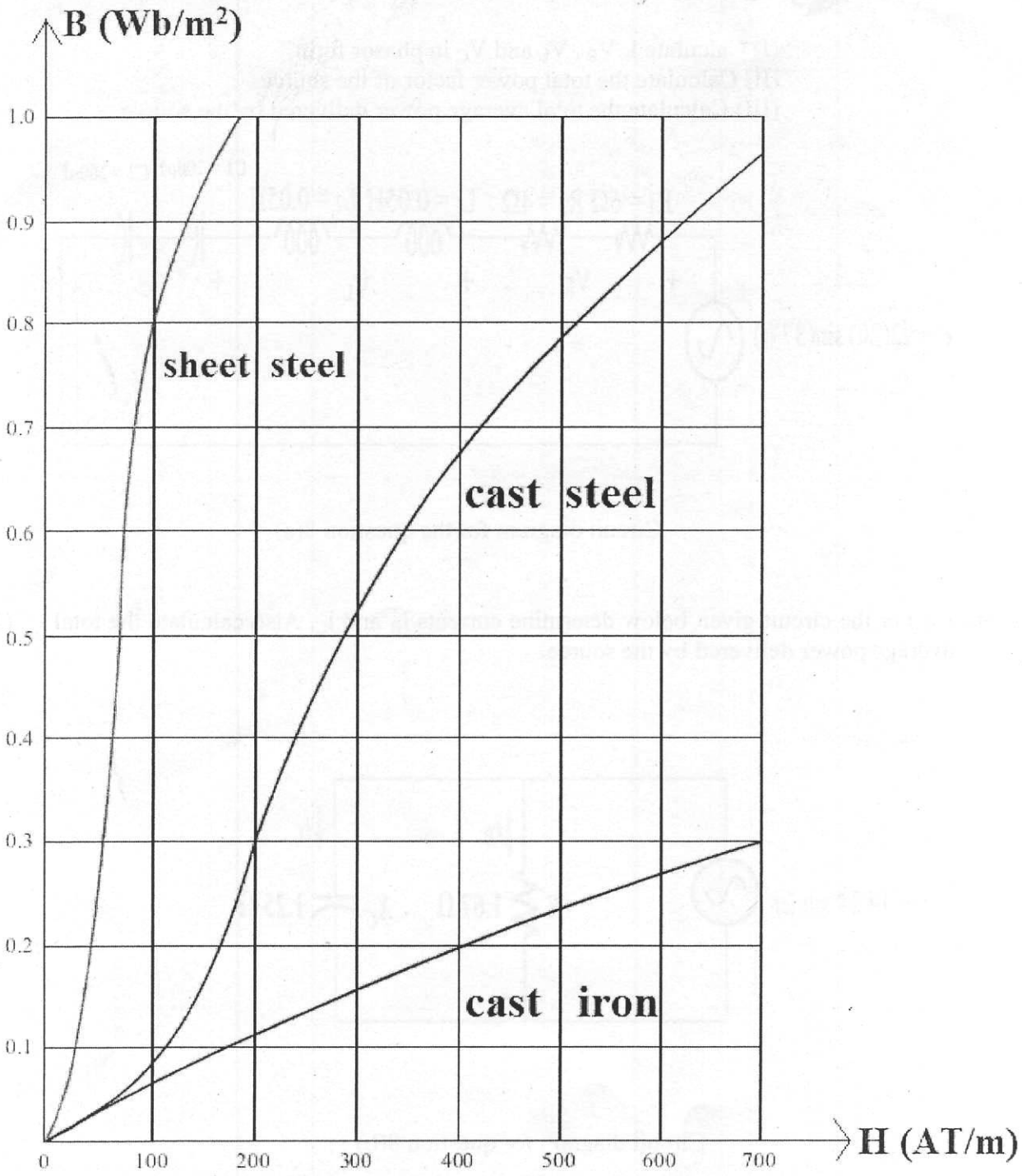


Circuit diagram for the question 8(a)

(b) For the circuit given below determine currents i_R and i_C. Also calculate the total average power delivered by the source. (12)



Circuit diagram for question 8(b)


B (Wb/m²)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
sheet steel
cast steel
cast iron
0
100
200
300
400
500
600
700
H (AT/m)