University of Asia Pacific

Department of Civil Engineering

Semester Final Examination Fall-2012

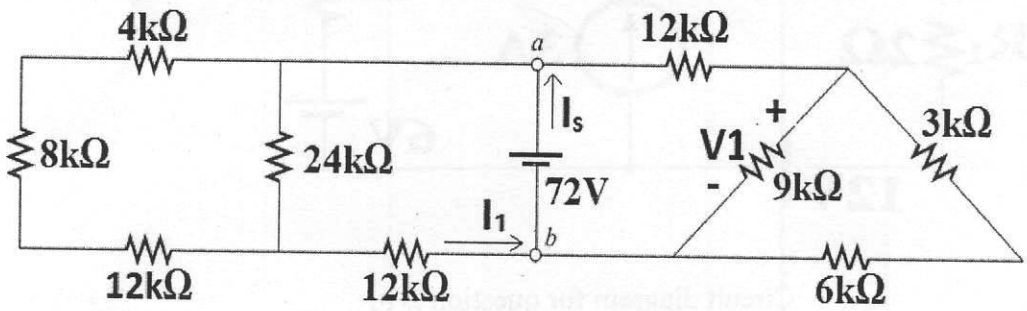
Program: B. Sc Engineering (2nd Year / 1st Semester)

Course Title: Basic Electrical Engineering Course No. ECE 201 Credits: 3.00

Time: 3.00 Hours. Full Marks: 150

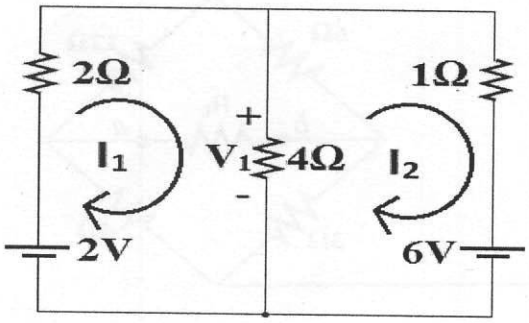
There are **Eight** Questions. Answer any **Six**. All questions are of equal value/Figures in the right margin indicate marks.

01. (a) Calculate the indicated currents (I_1 and I_s) and voltage (V1) for the figure shown below. (4+4+4)



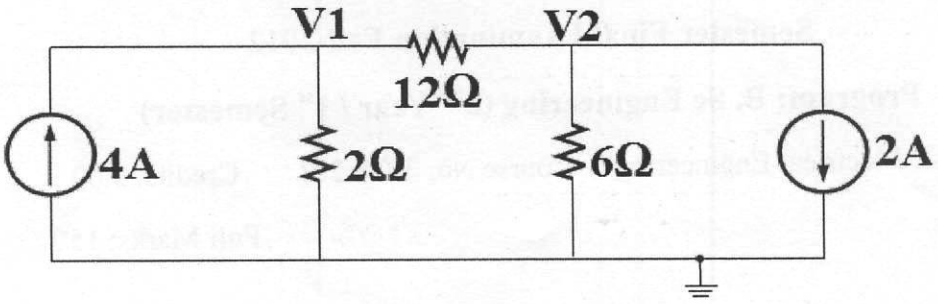
Circuit diagram for question 1(a)

(b) For the circuit given below, using mesh current method to find the mesh currents I_1 and I_2. Also find the voltage V_1 across the 4Ω resistor. (4+4+5)



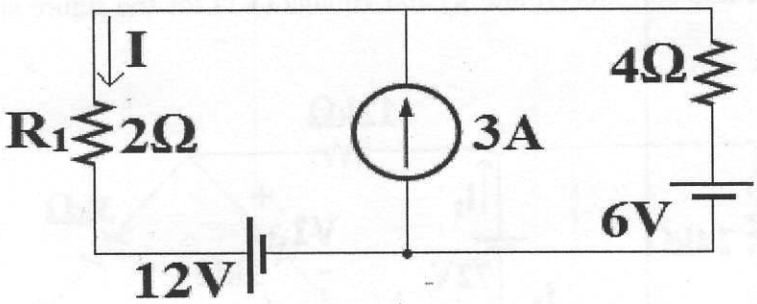
Circuit diagram for question 1(b)

02. (a) Determine the nodal voltages V1 and V2 for the network given below. (5+5)



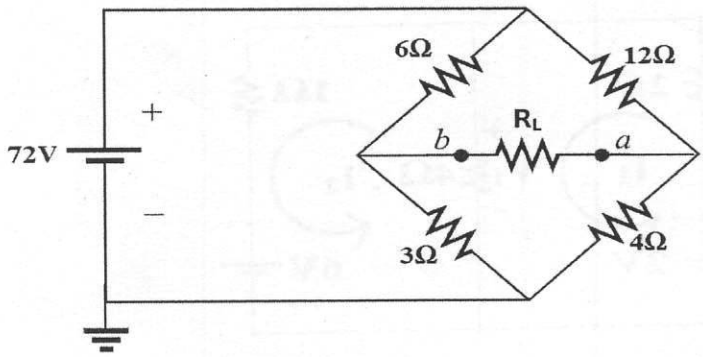
Circuit diagram for question 2(a)

(b) By using superposition method find the current through 2Ω resistor of the network given below. (5+5+5)



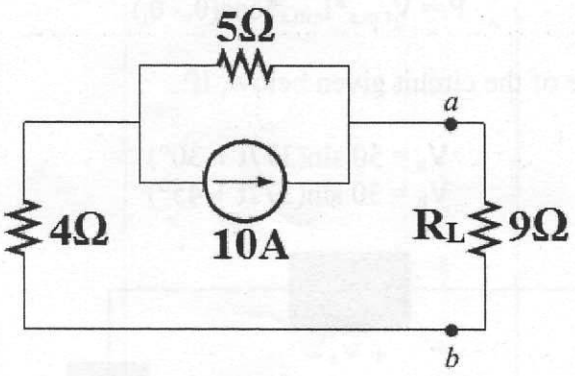
Circuit diagram for question 2(b)

03. (a) 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. (5+5+5)



Circuit diagram for question 3(a)

(b) Find the Norton equivalent circuit between points 'a' and 'b' (external to 9Ω resistor) for the network given below. (5+5)



Circuit diagram for question 3(b)

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

(b) For the magnetic circuit given below: (6+6)

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

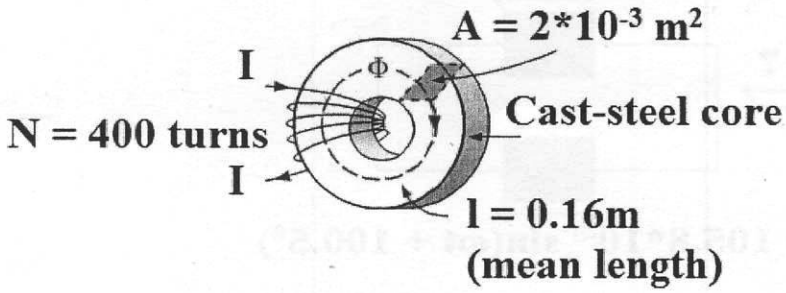


Figure for question 4(b)

05. (a) For an AC current $I = I_m \sin(\omega t)$, prove that, its r.m.s value is $I_{r.m.s} = I_m/(\sqrt{2}) = 0.707*I_m$. (12)

(b) Calculate the reading which will be given by a hot-wire voltmeter if it is connected across the terminals of a generator whose voltage is represented by: (7)

$$V = 200 \sin(\omega t) + 100 \sin(3\omega t) + 50 \sin(5\omega t)$$

[Hint: voltmeter always gives the r.m.s value]
(c) Add the following ac currents. (use any methods) (6)

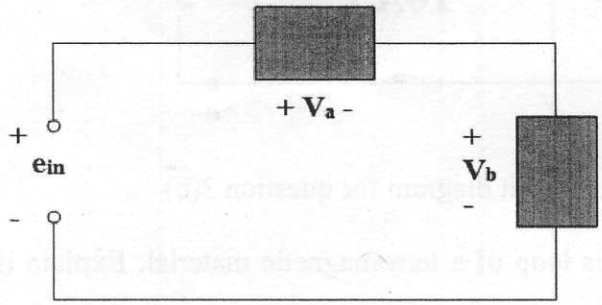
$$I_1 = 7 \sin(\omega t) \text{ and } I_2 = 10 \sin(\omega t + 60^0)$$

06. (a) Consider that an AC voltage $V = V_m \sin(\omega t + \theta_v)$ and the corresponding current fo $I = I_m \sin(\omega t + \theta_i)$. Prove that the real power is: (11)

$$P = V_{r.m.s} * I_{r.m.s} * \cos(\theta_v - \theta_i)$$

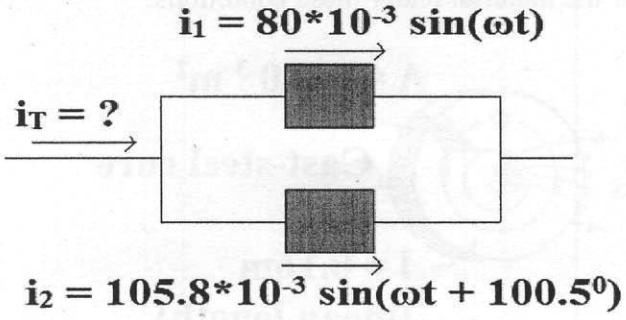
(b) Find the input voltage of the circuit given below. If: (7)

$$V_a = 50 \sin(377t + 30°)$$
$$V_b = 30 \sin(377t + 45°)$$



Circuit diagram for question 6(b)

(c) Find the total current i_T for the circuit given below. (7)



Circuit diagram for question 6(c)

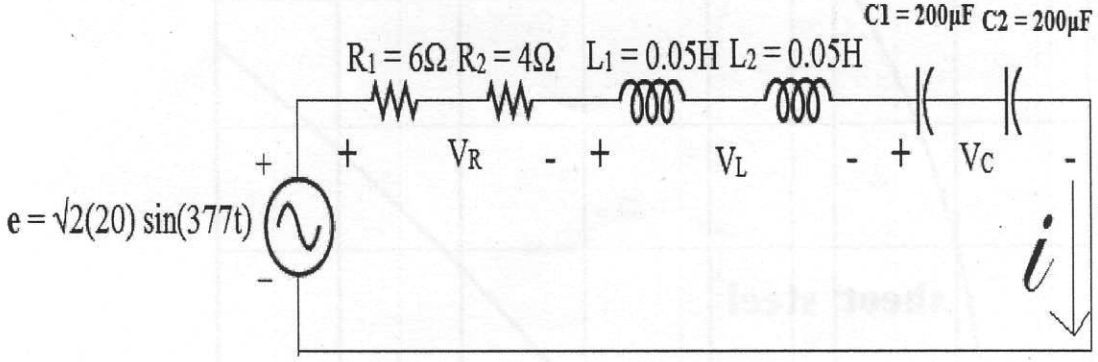
07. (a) Determine the phase relationship between the sinusoidal waveforms of each of the following sets. Also determine the real power P for each case. (5+5)

(I) $V = 10 \sin(\omega t + 30^0)$
$I = 5 \sin(\omega t + 70^0)$

(II) $V = 3 \sin(\omega t - 10^0)$
$I = 2 \cos(\omega t + 10^0)$

(b) For the circuit given below: (5+5+5)

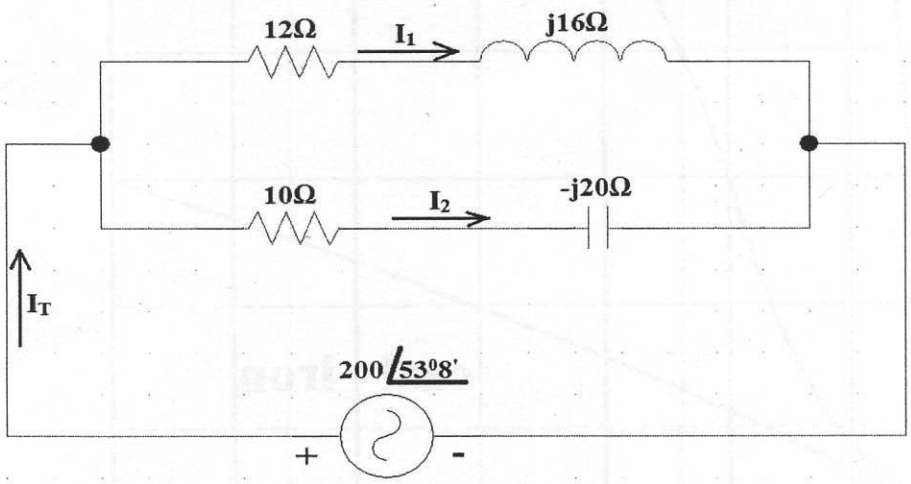
(I) Calculate I, V_R, V_L and V_C in phasor form.
(II) Calculate the total power factor of the source.
(III) Calculate the total average power delivered by the source.



Circuit diagram for the question 7(b)

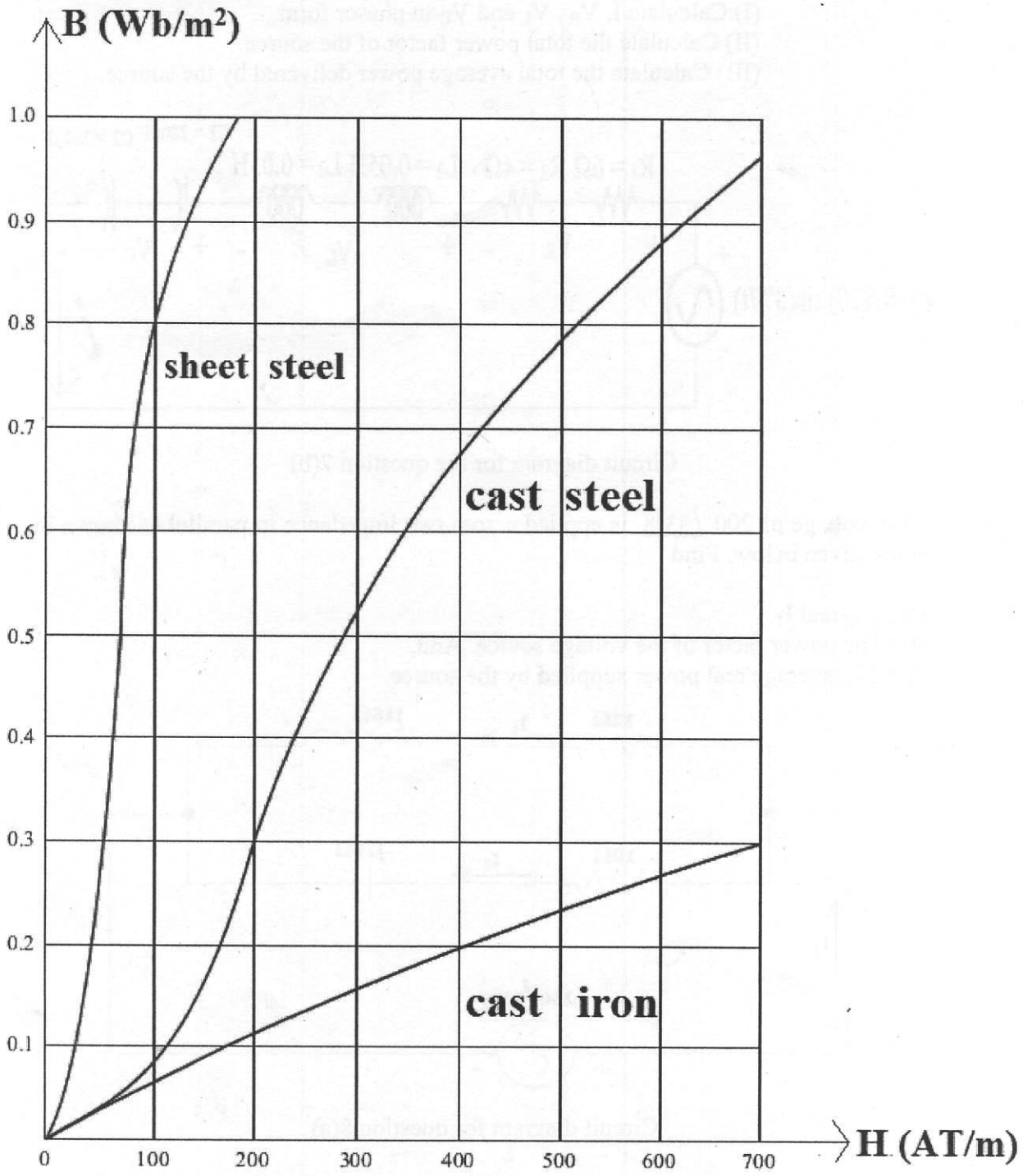
08. (a) A voltage of 200 $\angle 53^0 8'$ is applied across two impedance in parallel as shown in figure given below. Find (5+4+4)

(I) I_1, I_2 and I_T.
(II) The power factor of the voltage source. And,
(III) The average real power supplied by the source.



Circuit diagram for question 8(a)

(b) Define the terms: Power Factor, Form factor, Crest Factor, Frequency, Amplitude and Time Period. (give necessary examples) (6*2)


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)