Menoufiya University
Faculty of Engineering
Shebin El-Kom
First Semester Examination
Academic Year: 2013-2014

Department: Electrical Eng.
Year: 2nd Electrical
Subject/Code: *theory of Electric circuit* ELE 213
Time Allowed: 3 hours
Date: 12/1/2014

Part I [50 Marks]

Question (1): [Marks 21]

(a) Deduce the Bode plot (V_{dB}, θ) for a low-pass filter [Marks 7] [ILO's a4.3,b2.3]

(b) Design an R- C high–pass filter to have a cutoff frequency of 500 Hz using a resistor of 1.2 KΩ . Then sketch the resulting magnitude and phase plot for a frequency range of 0.1 fc to 10 fc. Also, if the input voltage to the filter is $20\angle 0$ V, using the sketches , find the output voltage of the filter if the input frequencies are 100 Hz , 500 Hz, and 1000 Hz. [Marks 7] [ILO's b2.2]

(c) Determine the following for the pulse waveform of Fig. 1
a) Positive or negative going b) base-line voltage c) pulse width d) amplitude
e) % tilt f) the average value [Marks 7]

[ILO's a13.2]

Question (2): [Marks 15]

(a) Deduce the expressions for the input and output impedances of the Z- parameter equivalent circuit. [Marks 7] [ILO's a4.1,b1.1,c1.1]

(b) Determine the admittance (Y) parameters for the network of Fig. (2) [Marks 8] [ILO's b1.2,c1.3]

Question (3): [Marks 14]

(a) Two impedances Z_1 and Z_2 are connected in parallel across a 200 V, 50 Hz supply, the impedance Z1 consists of 30 Ω resistance in series with 30 Ω inductive reactance while the impedance Z2 consists of a variable resistance in series with 25 Ω capacitive reactance. Draw the locus diagram of the total current and determine the resistance of Z2 for which the current is in resonance. [Marks 7] [ILO's c1.3]

(b) Obtain the equivalent mechanical equation for the electrical system shown in Fig. 3 [Marks 7] [ILO's a1-1, c1-1]

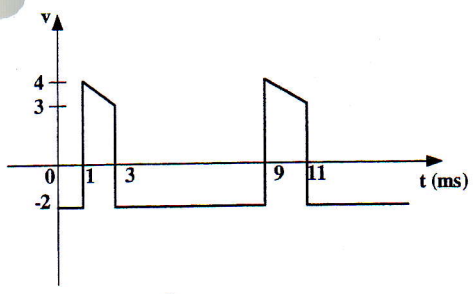

Fig.1

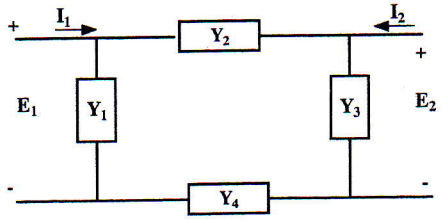

Fig.2

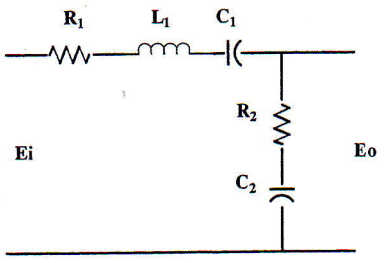

Fig.3

Part II

Question (4) **(15 marks)** [ILO's a4.3, b2.3]

(a) Determine the sum of the following two non-sinusoidal voltage waveforms :-
$V_1 = 30 + 20 \sin(20t) + 5 \sin(60t+30)$
$V_2 = 50 + 10 \sin(20t) + 30 \sin(40t) + 10 \cos(60t)$

(b) For the network of Fig.(4-b), determine :-
1- the sinusoidal expression for the voltage V_3
2- sketch V_3 and calculate its r.m.s value

Question (5) **(15 marks)** [ILO's b.11, C1.3]

(a) Using format approach to nodel analysis, find the voltage across the 4 Ohms resistor in Fig(5-a).

(b) Using mesh analysis , find the current through the 10 KΩ resistor in Fig.(5-b)

Question (6) **(20 marks)** [ILO's a4.1, b1.1, C.1.1]

(a) In the circuit shown in Fig. (6-a), the switch has been closed in position (1) for long time to establish the steady state current . When the switch is moved to position(2), a transient current exists in the two resistors for a short time . Determine :-
1-the current after 40 msec.
2-the energy dissipated in the resistors (R_1 , R_2)
3-sketch i_L, v_L, v_{R1}, and v_{R2} against time.

(b) RC series circuit with R=100 Ohms and C= 25 μF has a sinusoidal voltage source V= 250 sin(500t) Volts. Assuming there is no-initial charge on the capacitor, find:-
1- A mathematical expression for the circuit current.
2- How many cycles will occur during the transient period

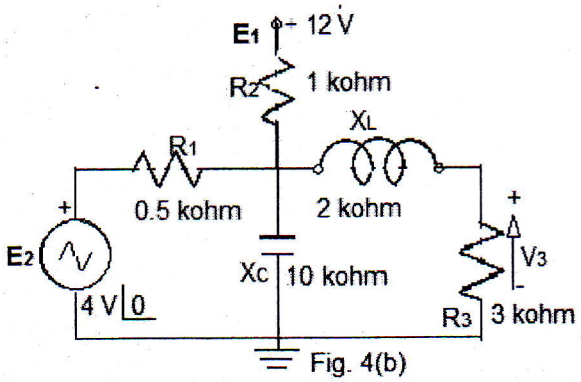

Fig. 4(b)

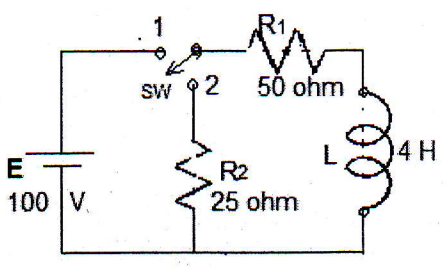

Fig. 6(a)

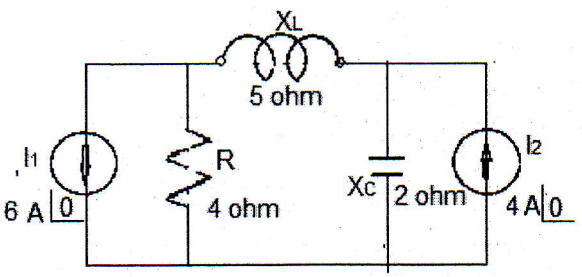

Fig. 5(a)

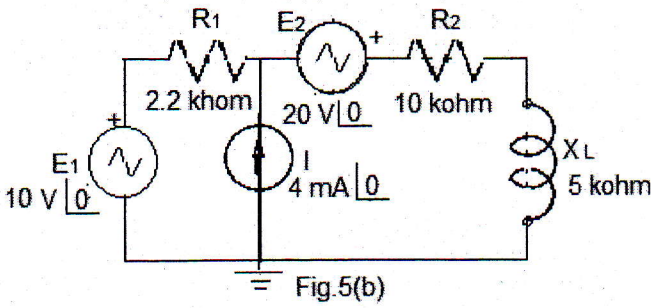

Fig.5(b)

With best wishes