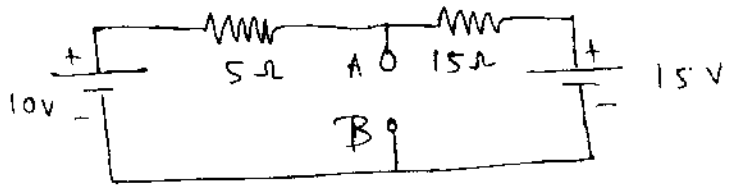
8. a) In the DC circuit, resistors $R_1 = 10\Omega$, $R_2 = 20\Omega$ and $R_3 = 100\Omega$ are connected, in turn, to terminals AB. Determine the power delivered to each resistor. 10



b) Find I_1, I_2 and I_T.

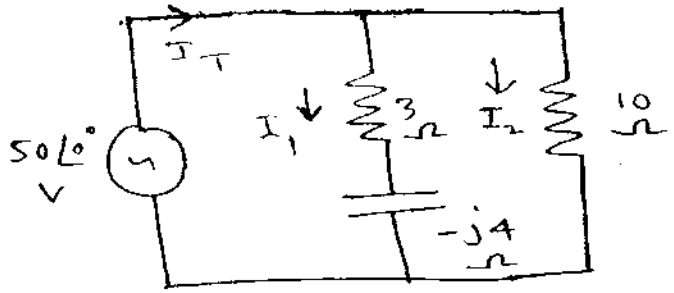
Draw the phasor diagram for the 3 currents.

Determine z_{eq} from V/I.

Hence compare this z_{eq} with equivalent impedance obtained by

$$z_{eq} = \frac{z_1 z_2}{z_1 + z_2} \text{ where}$$

z_1 and z_2 are the impedances of the 2 loops. 10



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BACHELOR OF COMPUTER Sc. ENGG. EXAMINATION, 2009

(1st Year, 1st Semester)

CIRCUITS AND NETWORK THEORY

Time : Three hours Full Marks : 100

Answer any ***five*** questions.

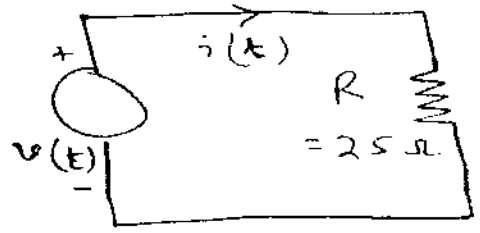
1. a) In the given circuit, the voltage function $v(t) = 100.\sin wt$ volts.

Find :

(i) current, i(t), (ii) instantaneous power, p(t) ,

(iii) average power, P.

Show graphically the variations of v(t), i(t) and p(t).

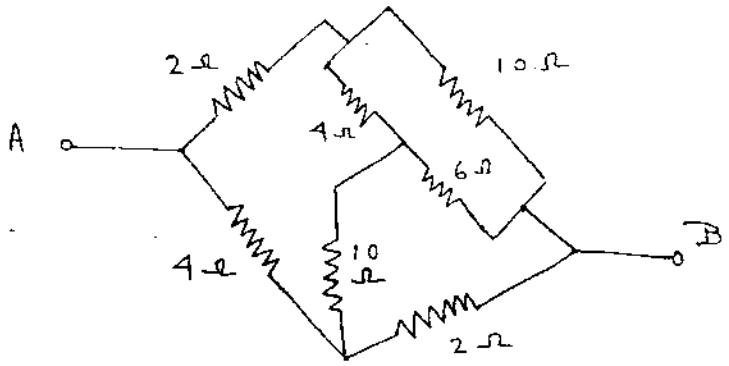


b) A capacitor of C farads has an applied voltage $v(t) = V_m \sin wt$ volts across it. Find the expressions for :

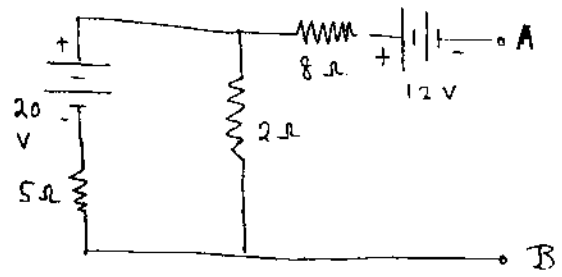
(i) current, i(t), (ii) power, p(t) , (iii) charge q(t). (iv) stored energy, w(t).

Also plot all the functions against time. Assume zero stored energy in the electric field at t = 0. 5+5

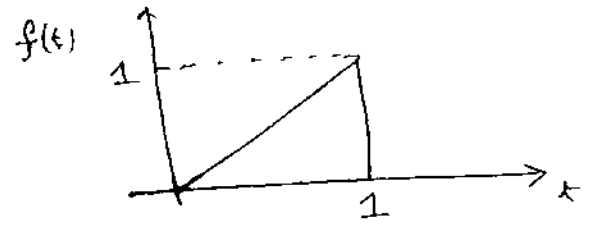
2. a) Find the value of a single resistance to replace the network between terminals A and B : 10



b) Obtain (i) Thevenin Equivalent circuit and (ii) Norton Equivalent circuit at terminals AB : 5+5



c) Find F(s) for the sawtooth f(t) ; 7



7. a) What is the difference between Fourier Series and Fourier Transform ? 3

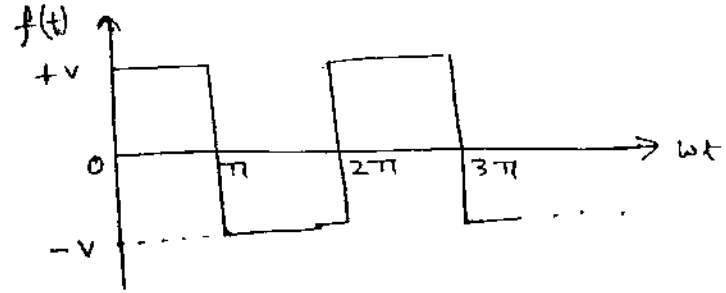
b) Define even and odd functions from the point of view of Fourier Series. Determine which of the following functions are even and which are odd :

(i) $f(x) = 2 + x^2 + x^4$

(ii) $f(x) = \sin x$

(iii) $f(x) = x + x^3 + x^5 + x^7$ 7

c) Find the Fourier Series (Trigonometric) for the square wave shown and plot the line spectrum : 10



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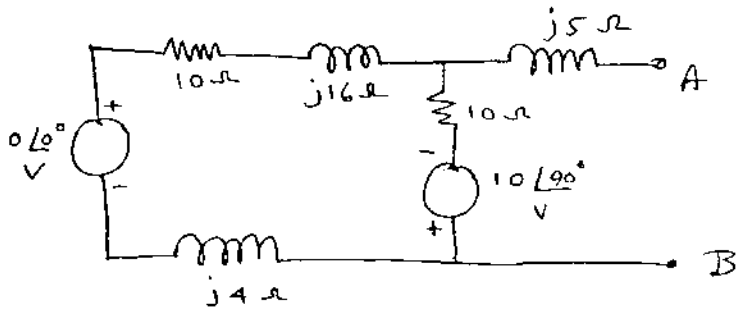
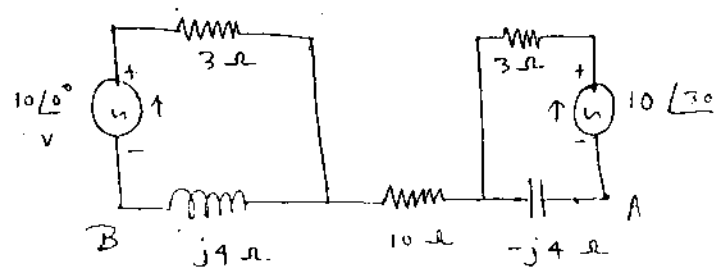
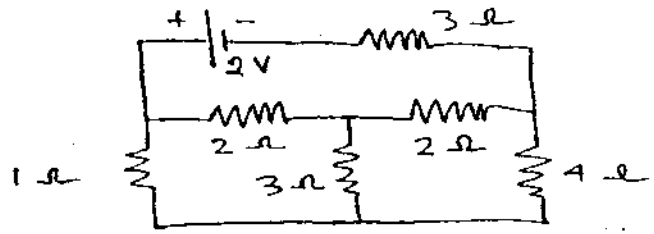
3. a) Obtain the Thevenin equivalent circuit at terminal AB : 10



b) For the given network, find the voltage across A and B. (V_{AB}) : 10



4. a) Find the current drawn from the 2 volt battery in the network : 10



b) Draw the practical characteristics of (i) a LPF ; (ii) a HPF; (iii) a BPF and (iv) a notch filter. Indicate clearly the corner frequencies and the bandwidths on the diagrams. When do circuits use BPF and when are notch filters used ? Explain the Roll-off rate. 6+2+2

5. a) Prove that WL and 1/wc have dimensions of ohms. 4

b) A series RC circuit with R = 10 L, has an impedance with an angle of – 45° at f_1 = 500 Hz. Find the frequency for which the magnitude of the impedance is (a) twice that at f_1 and (b) one-half that at f_1. 8

c) A series circuit consists of R = 1Ω, and inductive reactance j X_L = j4 ohms and a third impedance Z of $\vec{V} = 50\angle 45°$ volts and $\vec{I} = 11.2\angle 108.4°$A find out Z. 8

6. a) Find the Laplace Transform of

(i) $\frac{df}{dt}$

(ii) $\int f(t)\, dt$. 5

b) Find i(t) by Laplace Transform if the Switch is closed at t = 0.
Assume that the capacitor is initially uncharged. 8