

January, 2023
B.Tech. (ECE) IIIrd SEMESTER
Network Theory (EC-304)

Time : 3 Hours]

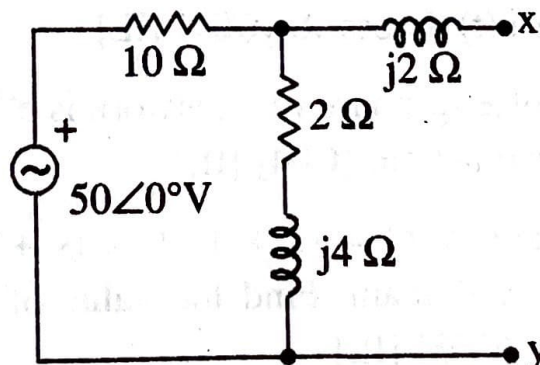
[Max. Marks : 75

Instructions :

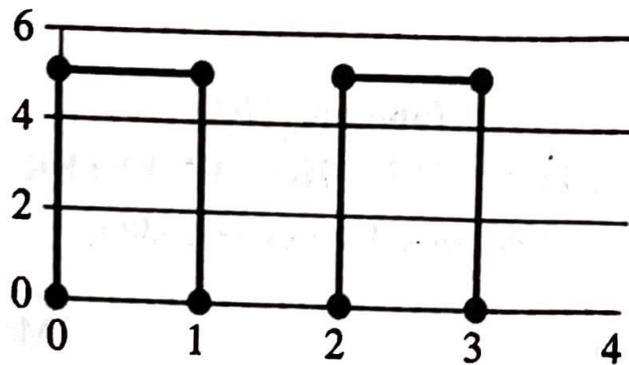
1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

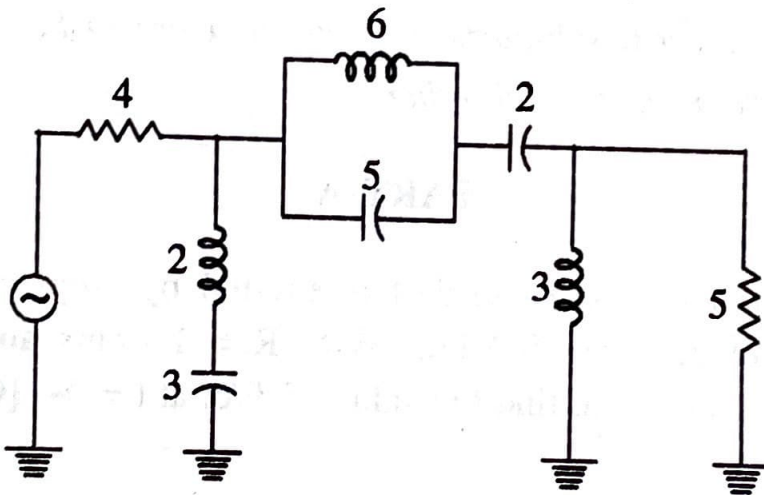
1. (a) An RC series circuit is excited by step voltage of magnitude 10 VDC. With $R = 1$ ohms and $C = 1$ microfarad, find the value of di/dt at $t = 0+$. [C01] [IL] (1.5)
- (b) For the circuit shown below find out the Norton current. [C01] [IL] (1.5)



- (c) Find Laplace transform of following periodic waveform
[C03] [IL] (1.5)



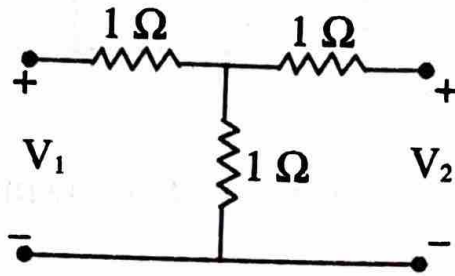
- (d) Explain, what is the effect of symmetry for a periodic function to determine the periodic trigonometric Fourier Series. [C05] [IL] (1.5)
- (e) Draw dual of the following circuit: [C01] [IL] (1.5)



- (f) In an RL parallel circuit excited by current source $i(t) = 5$ Amp. $R = 1$ ohm and $L = 1$ Henry. Find the value of voltage $v(t)$ across R. [C01] [IL] (1.5)
- (g) The impulse response of a network is $e^{-t} + e^{-2t}$. Find the transfer function. [C04] [IL] (1.5)
- (h) A voltage $V(s) = (s + 1) / (s(s + 2))$ is given in frequency domain. Find the value of voltage in time domain. [C03] [IL] (1.5)

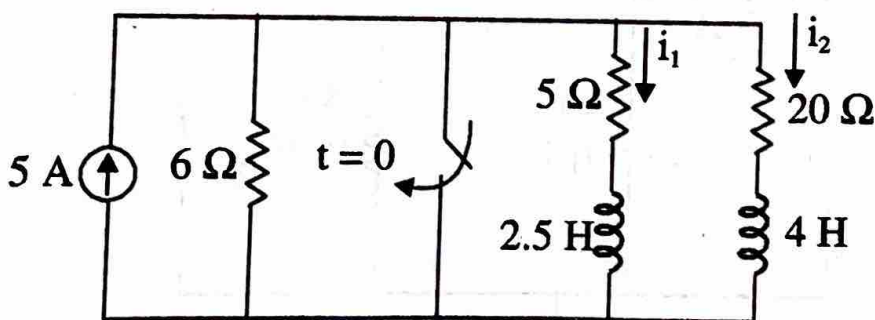
- (i) Find the value of attenuation for α low pass filter having $L = 10 \text{ mH}$ and $C = 1 \mu\text{F}$ at frequency, $f = 1000 \text{ Hz}$.
[C05] [IL] (1.5)

- (j) Calculate the value of parameters A, B only (part of T parameters) for the following circuit: [C04] [IL] (1.5)



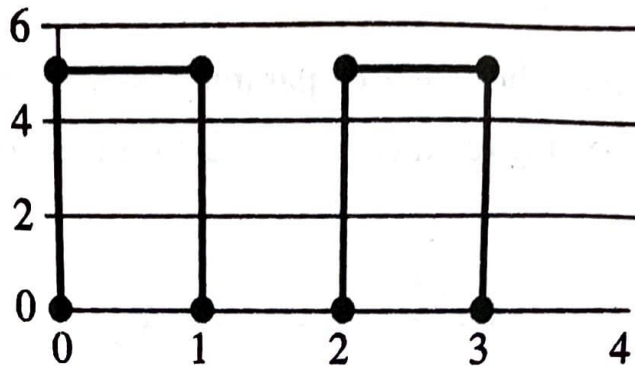
PART-B

2. (a) State and prove maximum power transfer theorem for AC circuit [C02] [IL] (7.5)
- (b) In the figure below the switch S is open for infinite time and then closed at time $t = 0$. Find the current $i_1(t)$ and $i_2(t)$. [C01] [IL] (7.5)

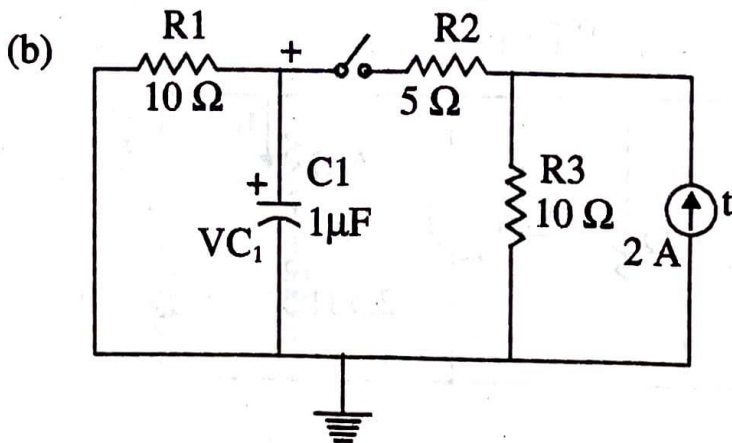
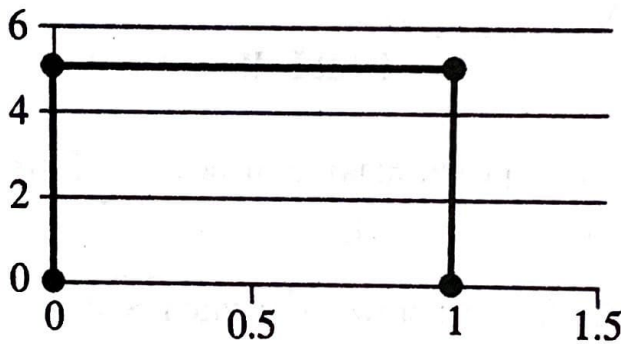


3. (a) For a signal $x(t) = 1$ for $-1 < t < 1$ and $y(t) = 1$ for $-2 < t < 2$. Find and plot the convolution of signals $x(t) * y(t)$. [C05] [IL] (7.5)

- (b) Find the exponential Fourier series of following period waveform. [C05] [IL] (7.5)

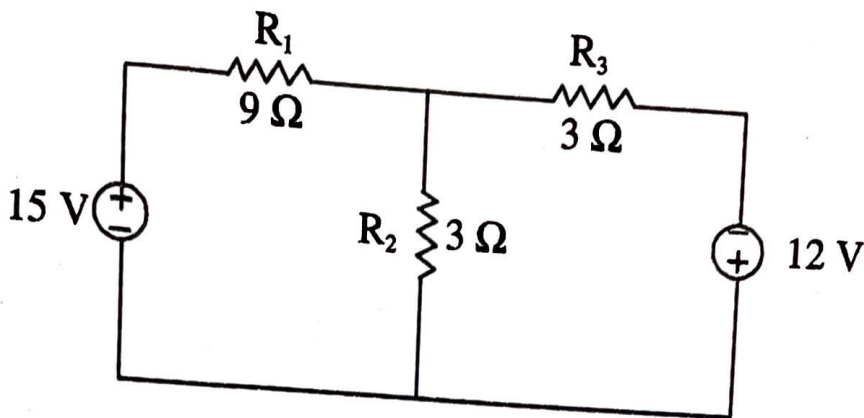


4. (a) Find Fourier transform of following waveform. [C05] [IL] (7.5)



- Switch S is closed for infinite time and then opened at $t = 0$. Find the value of capacitor voltage $V_{c_1}(t)$. [C01] [IL] (7.5)

5. (a) Prove Tellegen's theorem for the network given below:
[C02] [IL] (7.5)



- (b) Express Y parameters in terms of G parameters. [C04] [IL] (7.5)
6. (a) For a two port network prove condition for symmetry using Z parameters [C04] [IL] (7.5)
- (b) Output voltage of a network is given by $V(s) = 4s / (s + 2)(s^2 + 2s + 2)$. Plot its pole zero diagram and find out $v(t)$. [C03] [IL] (7.5)
7. (a) Design and draw a T type band pass filter having cut off frequencies $f_1 = 1000$ Hz and $f_2 = 1200$ Hz. Take $R_0 = 600$ ohm. [C05] [IL] (7.5)
- (b) Derive the expression for characteristics impedance Z_0 in terms of Z_1 & Z_2 for T type constant k filter. [C05] [IL] (7.5)