U.S.N

P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester, B.E. – Electronics and Communication Engineering

Semester End Examination; Dec. - 2014

Electrical Circuit Theory

Time: 3 hrs *Max. Marks: 100*

***Note** : i) Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*
ii) Assume suitable missing data if any.

Unit - I

1 a. Distinguish between the following with suitable example:
i) Lumped and distributed networks ii) Network and circuit iii) Passive and active networks. 10

b. Using repeated application of source transformation find V_0 in the circuit of Fig. Q1 (b). Also find the power dissipated in 8 kΩ resistor. 10

2 a. Illustrate the method of mesh analysis with an example and develop the mesh equations in the matrix forms: 10
[Z] [I] = [V]

b. For the network shown in Fig. Q 2(b), determine the node voltages V_1, V_2, V_3 and V_4 using nodal analysis. Also determine the power dissipated in the 10 Ω resistor. 10

Unit - II

3 a. Define the following terms with respect to network topology. Give examples. 10
(i) Graph (ii) Sub graph iii) Tree iv) Cut – set v) Tie – set.

b. For the oriented graph shown in Fig. Q 3(b), write the complete incidence matrix. Also write the cut – set and tie – set matrices considering branches 4, 5 and 6 as twigs. 10

4 a. Explain with examples the principles of duality. 10

b. For the network shown in Fig. Q4 (b), calculate I_{l_1} I_{l_2} and I_{l_3} using graph theory and network equilibrium equation based on KVL. Select the branches of the central T – network as the tree branches. 10

Unit - III

5 a. State superposition theorem. Explain with an example. 6

b. Determine Thevenin equivalent circuit as seen from terminals A – B of the network shown in Fig. Q 5(b). Find the value of load Z_L to be connected across A - B so that maximum power is delivered to Z_L. Find the maximum power. 8

c. Determine the voltage V_o, using Millman's theorem in the circuit of Fig. Q 5(c). 6

6 a. Define "Quality factor" and "Bandwidth" and establish a relationship between them in a series resonant circuit. 6

b. A voltage $V = 100 \sin \omega t$ is applied to an RLC series circuit. At resonant frequency the voltage across the capacitor was found to be 400 V, rms. The bandwidth is 75 Hz. The impedance at resonance is 100 Ω. Find the resonant frequency, quality factor and the constants (R, L, C) of the circuit. 7

c. Find the values of L for which the circuit shown in Fig. 6 (c) resonates at w = 5000 rad / sec. 7

Unit - IV

7 a. What is the need to study initial conditions in networks? Show that,

i) The current through an inductor cannot change instantaneously. 10

ii) The voltage across a capacitor cannot change instantaneously.

b. In the network shown in Fig. Q 7(b) the switch K is changed from position a to position b at t = 0, steady state having been reached in position a. Find the values of i, di/dt and d^2i/dt^2 at t = O+ 10

8 a. State and prove final value theorem as applied to Laplace transforms. 5

b. Obtain the Laplace transform of the periodic waveform shown in Fig. Q 8(b). 6

c. The switch in the network of Fig. Q 8(c) opens at t = 0. Use Laplace transformation analysis to determine the voltage across the capacitor for t ≥ 0. 9

Unit - V

9 a. What are poles and zero of a network function? Explain the restrictions on the pole and zero locations for transfer functions. 10

b. For the network shown in Fig. Q 9(b), determine the transfer function $\frac{V_2}{V_1}$, the driving point impedance z_{11} and the driving point admittance Y_{11}. 10

10 a. Define h – parameters. Show that the transmission parameter matrix of a cascade of two – port networks is the product of the transmission parameter matrices of the individual two – port networks. 10

b. Determine the y – parameters of the two – port network shown in Fig. Q 10 (c). Also draw the y – parameter equivalent circuit. 10

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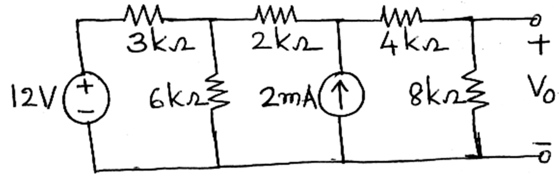


Fig Q 1(b)

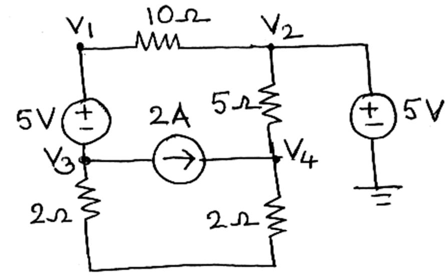


Fig Q 2(b)

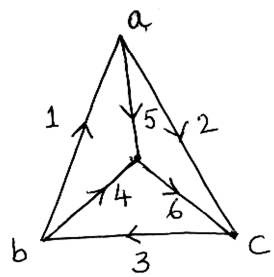


Fig Q 3(b)

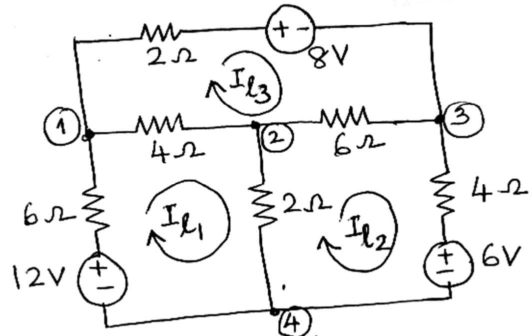


Fig Q 4(b)

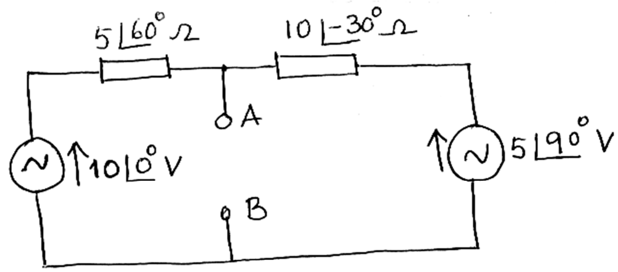


Fig Q 5(b)

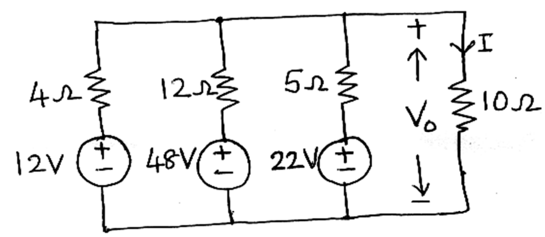
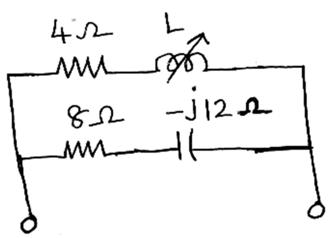


Fig Q 5(C)



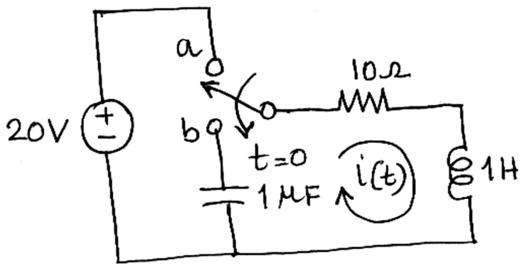


Fig Q 7(b)

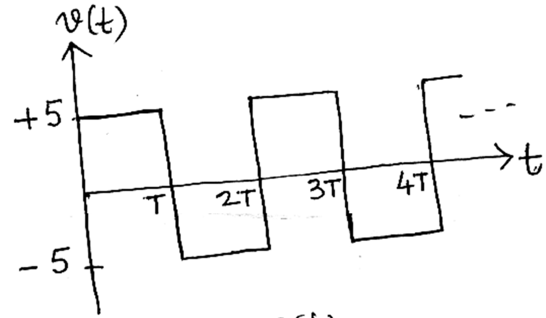


Fig Q 8(b)

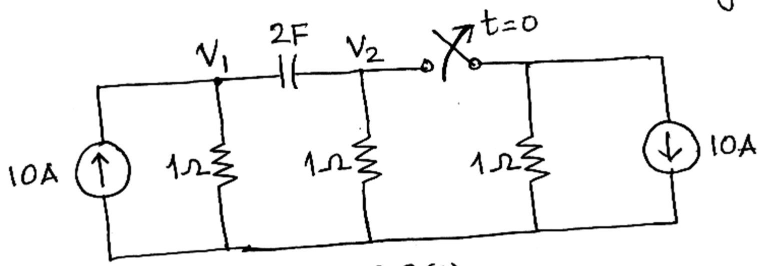


Fig Q 8(c)

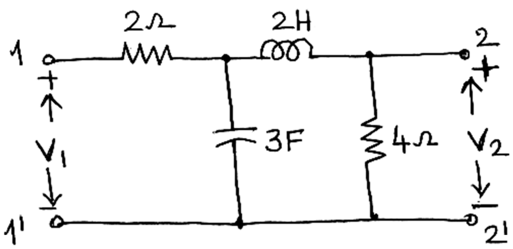


Fig Q 9(b)

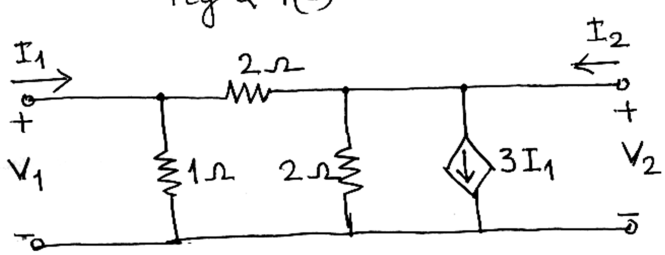


Fig Q 10(b)

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