P15EC35

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

(An Autonomous Institution affiliated to VTU, Belgaum)

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

Make-up Examination; Jan / Feb - 2017

Network Analysis and Synthesis

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. State and prove maximum power transfer theorem as applied to DC circuits. 7

b. Use nodal analysis in the circuit of Fig.1 to found the current through 30 Ω resistor. 7

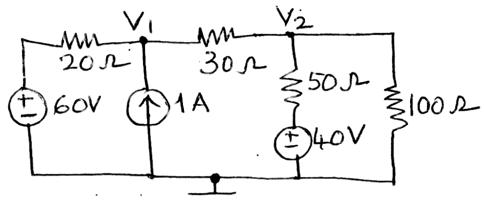


Fig 1 Q 1(b)

c. Find the voltage across the 4 Ω resistor using mesh analysis in the network of Fig. 2. 6

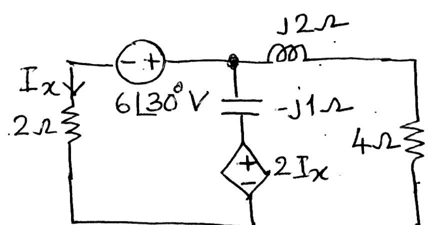


Fig 2 Q 1(c)

2 a. State and explain Norton's theorem as applied to AC circuits. 7

b. Use repeated application of source transformation to find V_0 in the circuit of Fig. 3. 6

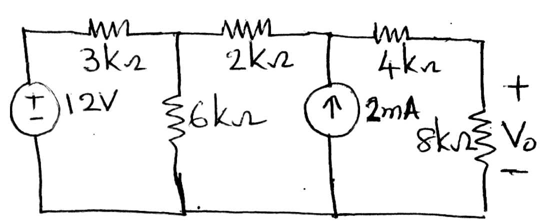


Fig 3 Q 2(b)

c. By using star-delta transformation technique, find the equivalent resistance R_{ab} and current I in the circuit shown in Fig. 4. 7

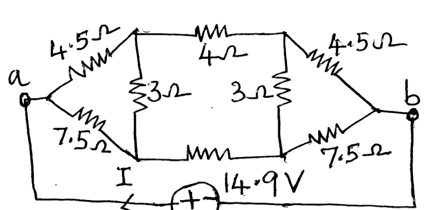


Fig 4 Q 2(c)

UNIT - II

3 a. For a series resonant circuit, obtain the expressions for ω_1 and ω_2 in terms of components values R, L and C also show that $\omega_0 = \sqrt{\omega_1 \omega_2}$. 7

b. A series RLC circuit has R = 10 Ω, L = 0.01 H and C = 100 µF, compute the resonant frequency, bandwidth, quality factor and half-power frequencies. 6

c. Define resonance in electric circuits. Compute the numerical values of ω_0, α, ω_d and R for a parallel resonant circuit having L = 2.5 mH, Q_0 = 5 and C = 0.01 µF. 7

4 a. What do you mean by initial conditions in electric networks? Show mathematically that the voltage across a capacitor cannot change instantaneously. 7

b. Determine the transient response of a series RL circuit under DC excitation. 7

c. In the network shown in Fig. 5 the switch is changed from position 1 to position 2 at t = 0, steady state having reached before switching. Find the values of i, di/dt and d^2i/dt^2 at $t = 0^+$. 6

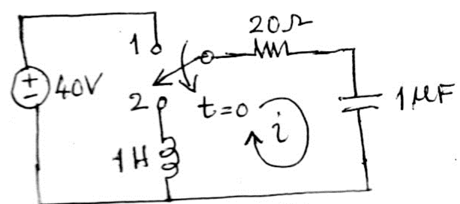


Fig.5 Q 4(C)

UNIT - III

5 a. Find the inverse Laplace transform of $V_S = \dfrac{2}{s^3 + 12s^2 + 36s}$. 6

b. State and prove convolution theorem as applied to Laplace transform. 7

c. For the network shown in Fig. 7 find $V_0(t)$ for $t > 0$ using mesh analysis in the s-domain circuit. 7

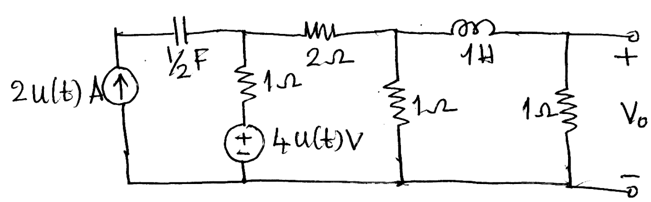


Fig.7 Q 6(C)

6 a. Determine $V(t)$ for $t > 0$ in the series RC circuit shown in Fig. 6. 7

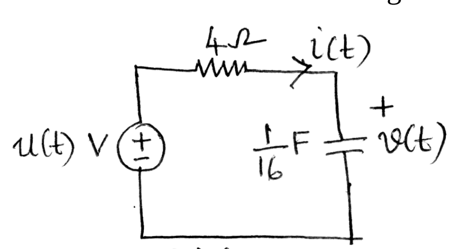
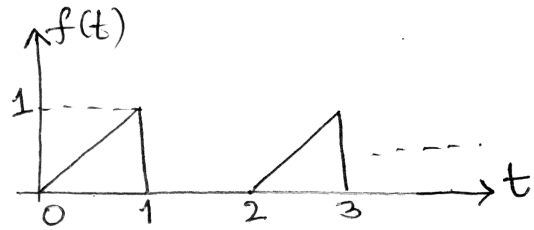


Fig 6

b. Find the Laplace transform of the waveform shown below. 7



c. Develop the models for an inductor and a capacitor in the *s*-domain. 6

UNIT - IV

7 a. Find the input impedance of the network shown in Fig. 8 7

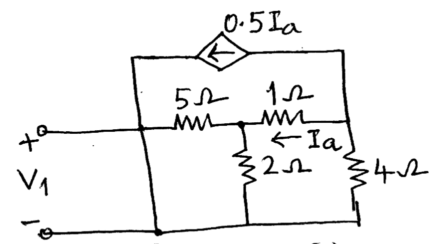


Fig. 8 Q 7(a)

b. Find the *y*-parameters for the network shown in Fig. 9. 7

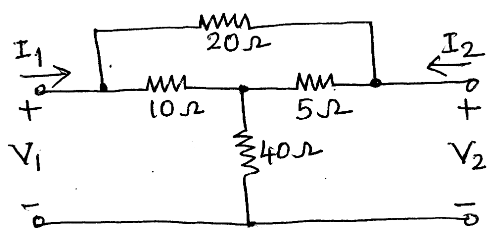


Fig. 9 Q 7(b)

c. Define *h*-parameters for a two-port network. Explain them in terms of Z-parameters. 6

8 a. Define the following with examples : 6

i) Planar graph ii) Sub-graph iii) Tree.

b. For the circuit shown in Fig. 10, draw the oriented graph and write, 8

i) The incidence matrix ii) Tie set matrix iii) *f*-cutset matrix.

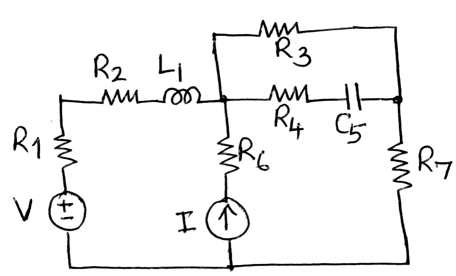


Fig. 10 Q 8(b)

c. Draw the dual of the network shown in Fig. 11. 6

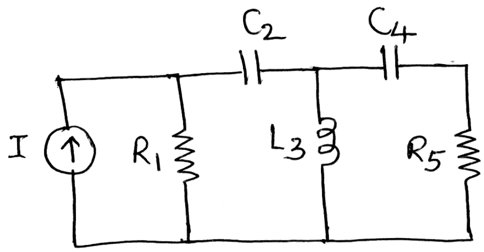


Fig. 11 Q 8(C)

UNIT - V

9 a. List the properties of Hurwitz polynomials. 6

b. Test whether $f_{(s)} = \dfrac{s^2+6s+5}{s^2+9s+14}$ is a positive real function. 6

c. Test whether the polynomial, $P(s) = s^4 + s^3 + 3s^2 + 2s + 12$ is Hurwitz. 8

10 a. Realize the Caver forms of the LC-impedance function, $Z_{(s)} = \dfrac{10s^4+12s^2+1}{2s^2+2s}$. 6

b. List the properties of positive real functions. 7

c. Realize Foster I form realization of the RC-impedance function :

$Z_{(s)} = \dfrac{(s+1)(s+3)}{s(s+2)(s+4)}$. 7

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