U.S.N

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

*(An Autonomous Institution affiliated to VTU, Belgaum)*

**Third Semester, B.E. - Electrical and Electronics Engineering**

**Semester End Examination; Dec - 2016/Jan - 2017**

**Network Analysis**

*Time: 3 hrs* *Max. Marks: 100*

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

**UNIT - I**

1 a. Draw a network which will have the following loop equations and determine $V_2$ such that there will be zero current through 4 Ω resistor. 10

$$\begin{bmatrix} 5+j2 & -j2 & 0 \\ -j2 & 4 & j2 \\ 0 & j2 & (2-j2) \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 50\angle 0 \\ 0 \\ -V_2 \end{bmatrix}$$

b. Use mesh analysis to evaluate the current *I* in the circuit shown in Fig. 1b. 5

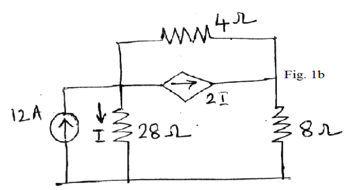

Fig. 1b

c. For a parallel circuit shown in Fig. 1C, obtain an expression for resonant frequency. Plot the graph of *I* versus frequency. 5

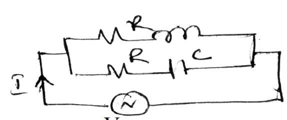

Fig. 1c

2 a. Using source transformation method, convert the circuit shown in Fig. 2a into a single current source in parallel with a resistor. 5

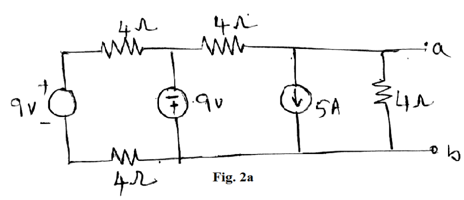

Fig. 2a

b. Find $V_a$, $V_b$ and $I_{ab}$ in the Fig. 2b by Y - Δ transformation. 10

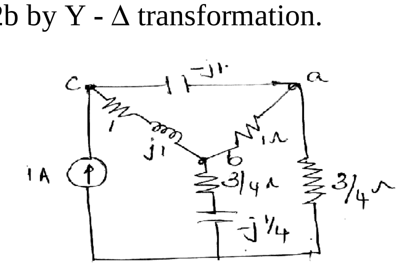

Fig. 2b

c. Obtain an expression for frequency ($f_L$) in terms of circuit components in a series resonant circuit when the voltage across inductor $V_L$ reaches its peak. Plot the variation of voltage across R, L and C as frequency varies. 5

## UNIT - II

3 a. Find the terminal voltage $V_{ab}$ for the circuit shown in Fig. 3a using superposition theorem.

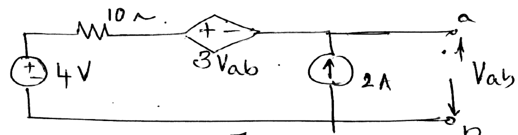

Fig 3a 6

b. State and prove maximum power transfer theorem for an AC circuit when both resistance and reactance parameters of the load are variable. 7

c. For the graph shown in Fig. 3c, select a tree and write the cut set schedule. Obtain there from the equation giving branch voltages in terms of tree branch voltages. 7

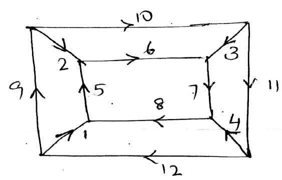

Fig 3c

4 a. Obtain the Thevenin's equivalent circuits across terminals A and B for the circuit shown in Fig. 4a. 10

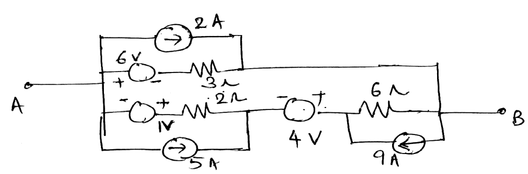

Fig 4a

b. For the circuit shown in Fig. 4b, find the current *i*, using super poistion theorem. 5

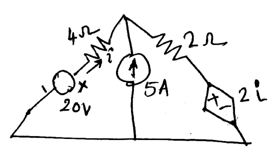

Fig 4b

c. What is duality of electrical network? Explain with an example. 5

## UNIT - III

5 a. For the circuit shown in Fig 5a. switch is closed at $t = 0$ ,

find, $i_1(0+), i_2(0+), \frac{di_1}{dt}(0+), \frac{di_2}{dt}(0+), \frac{d^2i_1}{dt^2}(0+)$ and $\frac{d^2i_2}{dt^2}(0+)$ 10

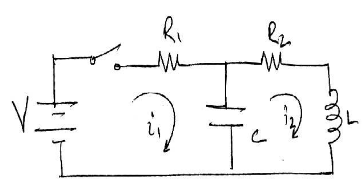

**Fig. 5a**

b. Find the Laplace transform of a half wave rectified sine wave show in Fig. 5b. 6

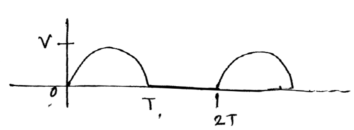

Fig 5b

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c. Obtain an expression *e(t)* for the wave fin shown in Fig. 5c. 4

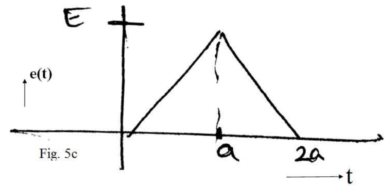



Fig. 5c

6 a. For the circuit shown in Fig 6a the switch is closed to position (1) at $t$ = 0, then moved to position(2) after 1 m sec. Find the time at which the current in zero and reversing the direction. 10

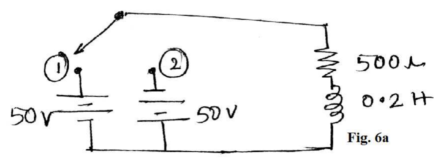



Fig. 6a

b. Find the Laplace transform of the waveform shown in Fig. 6b. 6

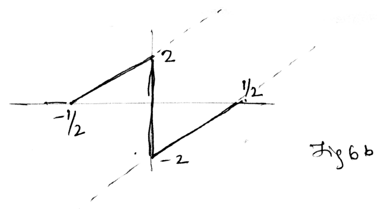



Fig 6b

c. Find $V_1$ and $V_2$ at $t$ = 0+ and $t = \infty$, for the circuit shown in Fig. 6c. 4

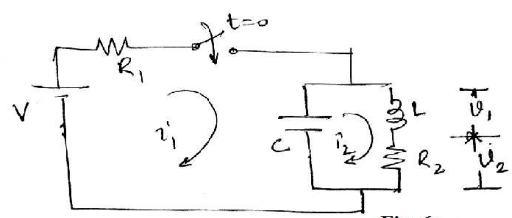



Fig. 6c

## UNIT - IV

7 a. In the circuit shown in Fig. 7a, switch is closed at $t$ = 0. Obtain an expression $i_2(t)$ using Laplace transformation method. 10

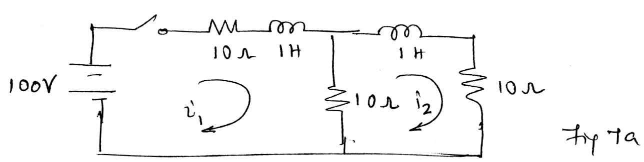



Fig 7a

b. In the circuit shown in Fig. 7b. obtain an expression for $I(S) = \frac{V(S)}{Z(S)}$ 6

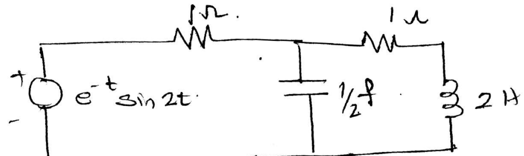
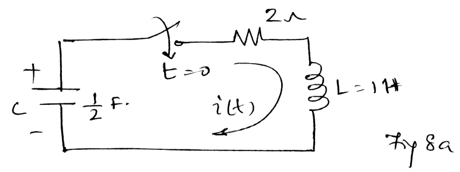


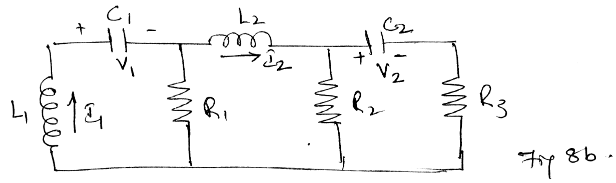

Fig. 7b

c. Using convolution theorem find response to an excitation of $v(t) = e^{-2t}$ given that the impulse response of the network is $h(t) = \delta(t) - e^{-3t}$. 4

8 a. Obtain an expression for *i(t)* using Laplace transformation method. Assume capacitor has charged to 1 V at $t$ = (0-) (refer Fig. 8a) 10




b. Write the transformed network for the circuit shown in Fig. 8b. Initial currents and voltages are present at time $t$ = 0. 6




c. State and explain Duhamel's superposition theorem. 4

**UNIT - V**

9 a. Plot the time response for the following : 8

i) Complex conjugate poles on left half of S plane

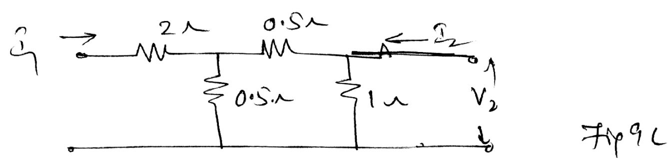
ii) A simple real pole on the left half of S plane

iii) Complex conjugate poles on right half of S plane.

b. Obtain the following: 8

i) h parameters in terms of ABCD parameter ii) h paramter in term of Y parameter.

c. Find Y parameter of the following resistance network shown in Fig. 9C. 4




10 a. Draw the second order response of the system if, 8

i) δ = 0 (no damping) ii) 0 < δ < 1 (damping < 1)

iii) δ > 1 (damping > 1) iv) δ = 1 (critically damped)

b. Write the networks which are equivalent to the general two port network in terms of, i) Z- parameter ii) h - parameters 8

c. Find the Y parameter for the network shown in Fig. 10 C. 4


Fig. 10c

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