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

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Semester End Examination; March - 2021

Electric Circuit Analysis

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: To solve problems on electrical network using different techniques and theorems, resonance concepts.

CO2: To obtain graphical solution to electrical networks using Network Topology.

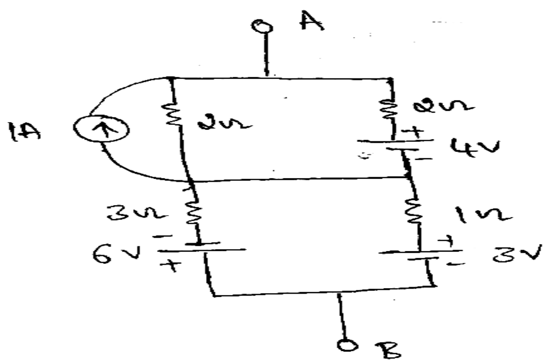
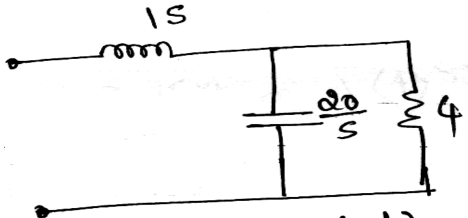
CO3: Analyze the network under transient condition due to switching.

CO4: Analyze and obtain the time domain response of R, L, C circuits for all types of excitations using Laplace transforms.

CO5: Represent the two port networks by Z,Y, ABCD and Parameters and Assessment of stability of network from network function.

Note: ***I) PART - A*** *is compulsory.* ***Two*** *marks for each question.*

II) PART - B*: Answer any* ***Two*** *sub questions (from a, b, c) for Maximum of* ***18 marks*** *from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I: PART - A	**10**			
1 a.	Replace the given network with a single voltage source and resistor between terminals *A* and *B*. 	2			
b.	What are the conditions for series resonance?	2			
c.	Find inverse Laplace transform of the function $F\left(s\right)=\dfrac{s^2-3s+4}{s^3}$.	2			
d.	Find driving point admittance function of the following network shown in Fig. (1d).  Fig. (1d)	2			
e.	Define two port networks and give the classification of two port network parameters.	2			

Contd... 2

II: PART - B — 90

UNIT - I — 18

1 a. Find an equivalent resistance between *A* and *B* of the networks shown in Fig. 1(a). — 9

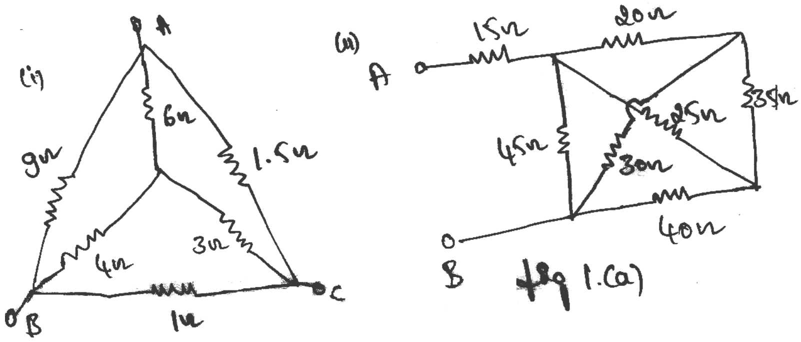


fig 1.(a)

b. Find Currents I_1, I_2, I_3 and I_4 for the network shown in Fig. (1.b). — 9

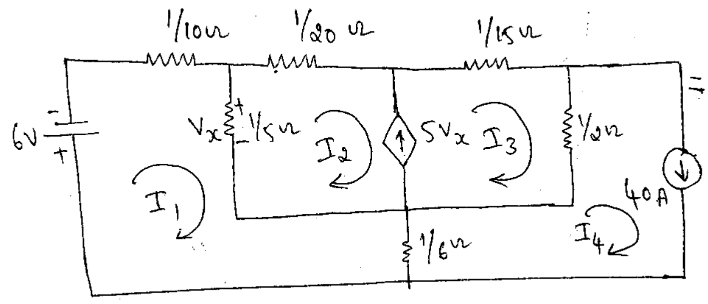


fig.(1.b)

c. Find the current through 9 Ω resistor using Thevenin's theorem for the circuit shown in Fig. (1.c). — 9

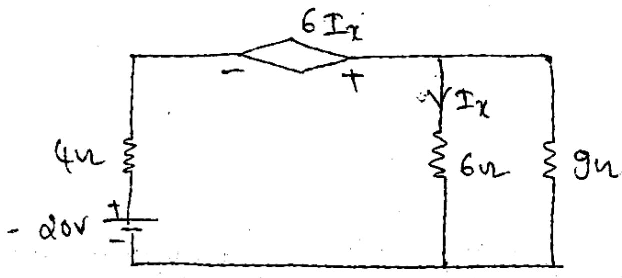


fig (1.c).

UNIT - II — 18

2 a. Derive an expression for resonant frequency and current at resource for the network shown in Fig. (2.a). — 9

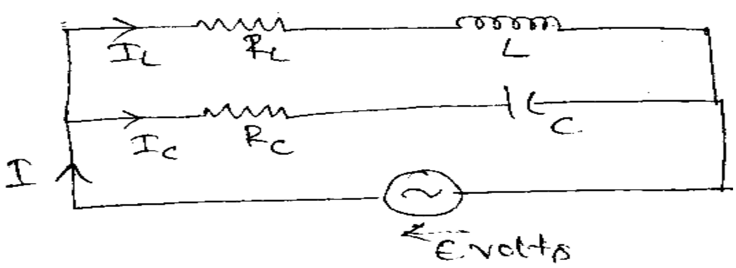


fig. (2a)

b. A series RLC circuit has a resistance of 10 Ω, an inductance of 0.3 H and a capacitance of 100 μF. The applied voltage is 230 V. Find; 9

i) The resonant frequency ii) The quality factor

iii) Lower and upper cut off frequencies iv) Bandwidth

v) Current at resonance vi) Currents at f_1 and f_2

vii) Voltage across inductance at resonance

c. A series RL circuit consists of a resistance of 5 Ω and inductance of 0.02 H is connected across the voltage $V = (100 + 50 \sin 500t + 25 \sin 1500t)\ V$. Find; 9

i) Current ii) Average power iii) Power factor

Also write the expression for the current in the circuit.

UNIT - III **18**

3 a. For the network shown in Fig. (3.a) the switch is changed from position (1) to (2) at $t = 0$ steady state having reached before switching. Find the value of i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$. 9

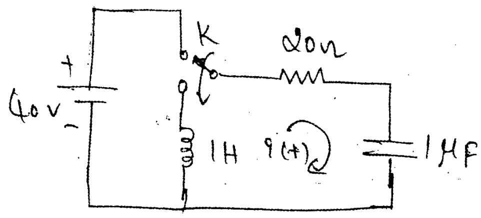


fig (3.a)

b. In the network shown in Fig. (3.b) a steady state is reached with the switch '*K*' open. At $t = 0$, the switch is closed. For the elemental values given. Determine the value of $V_a(0^-)$, $V_a(0^+)$ and $V_b(0^+)$. 9

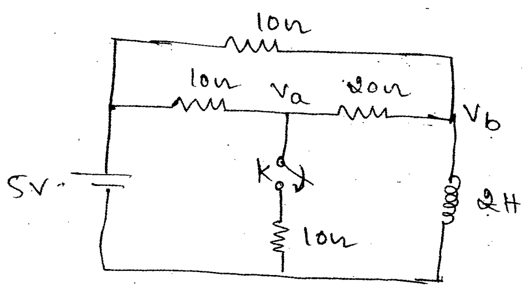
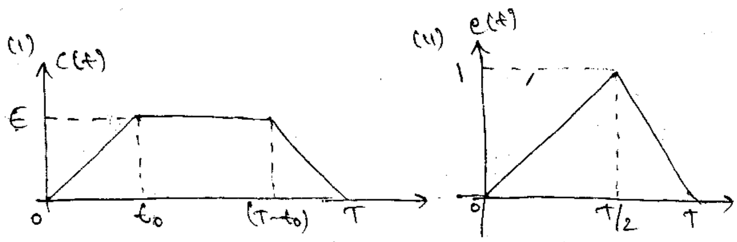


fig (3.b)

c. Write the equation for the waveforms shown in Fig. (3.c) and find its Laplace transform. 9



fig(3.c).

UNIT - IV **18**

4 a. A balanced star connected load of 150 kW having an impedance of $6.351\angle 38.06\ \Omega$ is connected to a 3ϕ, 4 wire, 1100 V RYB system. Find the line currents, circuit constants of the load per phase and also draw the vector diagram. 9

b. Currents I_1 and I_2 entering at port 1 and port 2 respectively of a two port networks are given by the following equations: 9

$I_1 = 0.5\ V_1 - 0.2\ V_2 \qquad I_2 = -0.2V_1 + V_2$

Find *Y*, *Z* and *ABCD* parameters for the network.

c. Obtain the following: 9

i) z-parameter in terms of y-parameters

ii) h-parameters in terms of z-parameters

UNIT - V **18**

5 a. Find the driving point admittance for the network shown in Fig. (5.a). 9

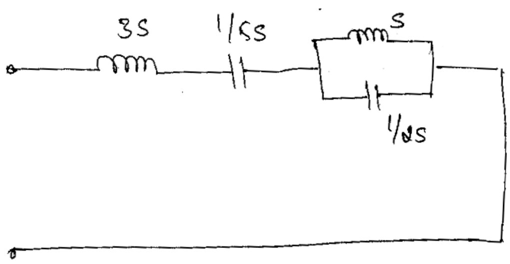


fig 5.a

b. Find the impulse response of the voltage across the capacitor in the network shown in fig. 5b, also determine response $V_c(t)$ for step input. 9

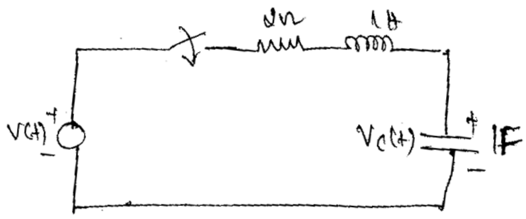
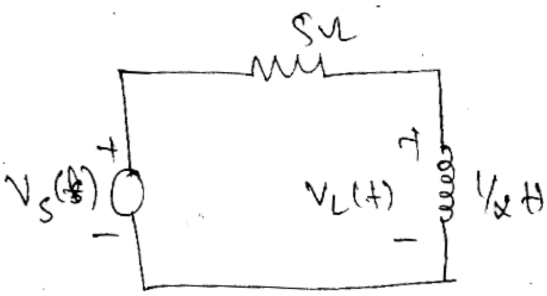


fig 5b

c. Determine the expression for $V_L(t)$ in the network shown in Fig. (5.c) when, 9

i) $V_s(t) = \delta(t)$ ii) $V_s(t) = e^{-t}\ u(t)$



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