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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 / April - 2022

Electrical 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.

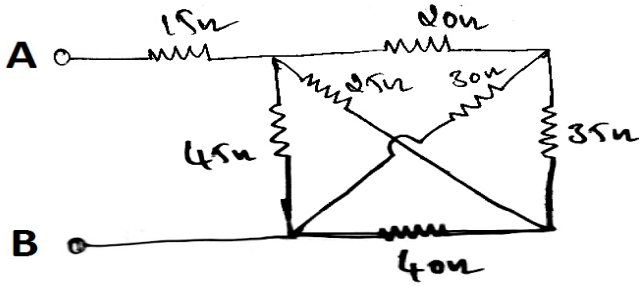
CO4: Analyze and obtain the time domain response of R, L, C circuits for all types of excitations using Laplace transforms.

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
		I : PART - A	**10**
I	a.	Write the circuit symbols for four dependent sources.	2
	b.	Mention any two dirichlet conditions of Fourier series.	2
	c.	Obtain the Laplace transform of a Gate function.	2
	d.	Three similar resistors are connected in star across 450 V, 3 phase lines. The line current is 10 A. If the same resistors are connected in delta across the same supply, calculate the power consumed.	2
	e.	List any four properties of driving point admittance of LC network.	2
		II : PART - B	**90**
		UNIT - I	**18**
1	a.	Find an equivalent resistance between A and B for the network shown below,	9



	b.	Solve for the current *I* in the circuit shown in Fig. Q1(b) using node analysis.	9

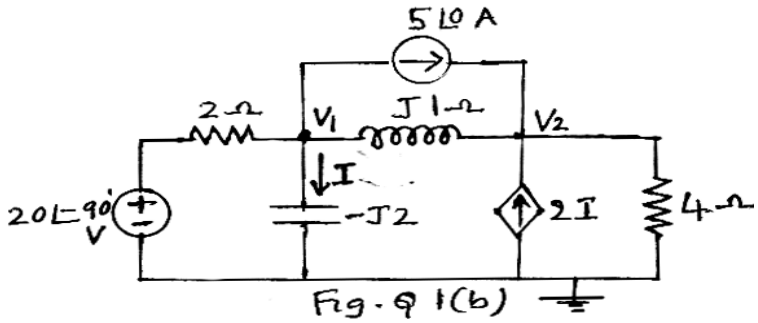


Fig. Q 1(b)

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c. Find the Thevenins equivalent circuit at the terminals AB for the network shown in Fig.Q1(c) and hence determine the current in the resistance of 1 Ω connected between AB. 9

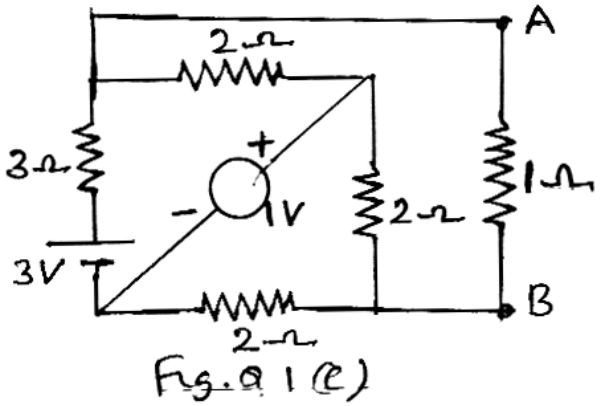

Fig. Q 1 (c)

UNIT - II **18**

2 a. List the properties of series resonance and give the applications of the same. 9

b. Find the trigonometric Fourier series for the waveform shown in Fig. Q2(b). 9

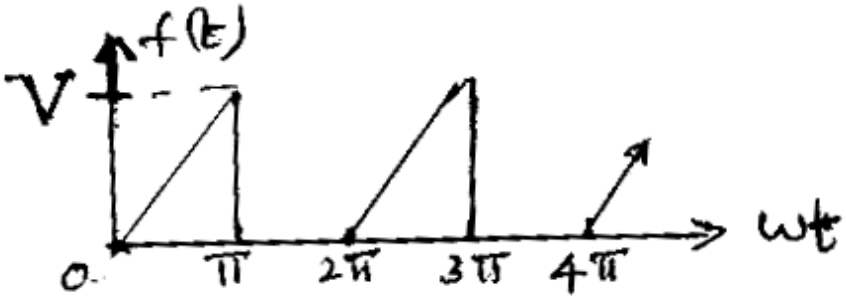

Fig Q 2(b)

c. A voltage $v = 50 + 25\sin500t + 10\sin1500t + 5\sin2500t$ volts applied to the terminals of a passive network and the resulting current is, 9

$i = 5 + 2.23\sin(500t - 26.6^o) + 0.556\sin(1500t - 56.3^o) + 0.186\sin(2500t - 68.2^o)$ A.

Find the effective voltage, effective current and the average power.

UNIT - III **18**

3 a. In the given network of Fig. Q3(a), the switch '*K*' is opened at $t = 0$. At $t = 0+$ solve for the values of v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ if $I = 2$ A, $R = 200\ \Omega$ and $L = 1$ H. 9

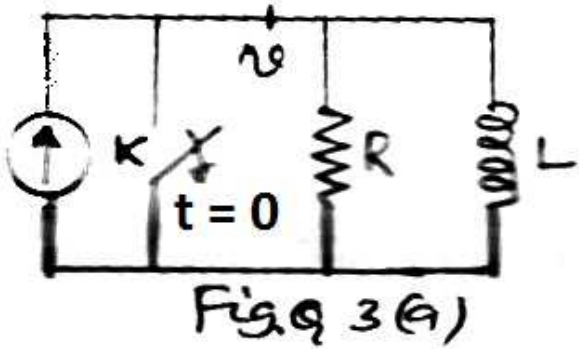

Fig Q 3(a)

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b. In the circuit shown in Fig. Q3(b), steady state is reached with switch '*K*' open. The switch is closed at $t = 0$. Determine i_1, i_2, $\frac{di_1}{dt}$ and $\frac{di_2}{dt}$ at $t = 0+$. 9

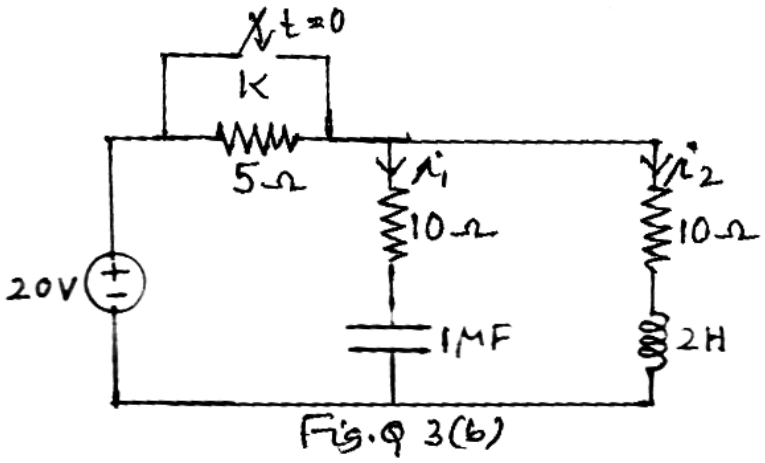
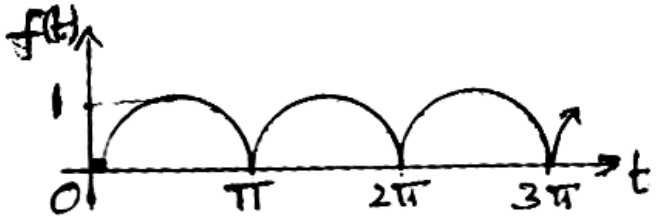


Fig. Q 3(b)

c. For the waveform shown below, show that the Laplace transform is given by $F(s) = \frac{1}{(s^2+1)} \coth\left(\frac{\pi s}{2}\right)$. 9



UNIT - IV **18**

4 a. A three phase, three wire, 100 volts, ABC system supplies a balanced delta connected load with impedances of $20\angle 45^\circ$ ohms. Determine the line current and draw the phasor diagram. 9

b. (i) Obtain Z-parameters in terms of y-parameters. 4

(ii) Find Z-parameters for the network shown in Fig. 4b.

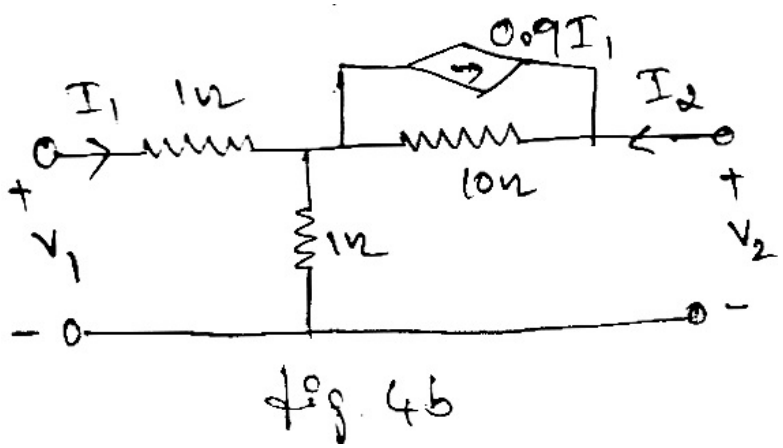


Fig. 4b 5

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c. Find the '*h*' parameters of the network shown in Fig. Q4(c). 9

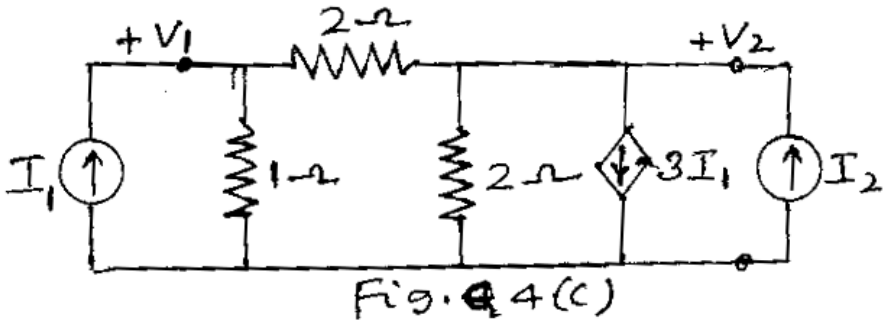

Fig. Q4(c)

UNIT - V **18**

5 a. Find the transform impedance of the network shown in Fig. Q5(a). 9

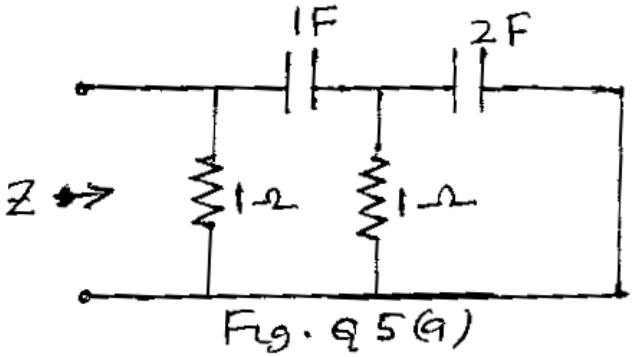

Fig. Q5(a)

b. Explain significance of poles and zeroes and draw pole-zero plot for, 9

$$V(S)=\frac{(S+1)(S+3)}{(S+2)(S+4)}$$

c. In the network shown in Fig. Q5(c), the switch '*K*' is closed at $t = 0$. Find an expression for the current *i(t)* using Laplace transform method. 9

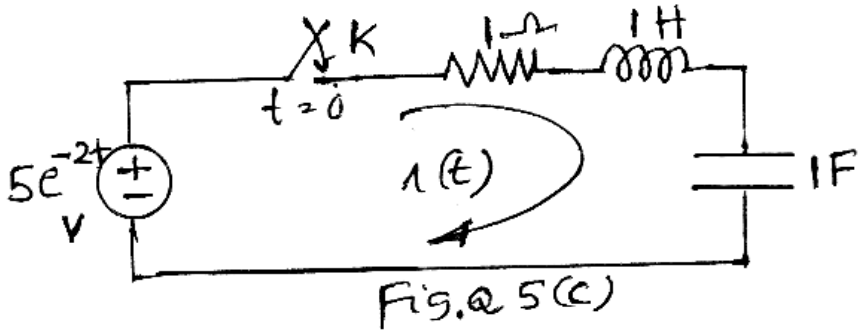

Fig. Q5(c)

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