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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; Dec. - 2019

Electrical Circuit Analysis

Time: 3 hrs *Max. Marks: 100*

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.	Explain the concept of super Mesh in the analysis of network using mesh analysis.	2
b.	List out the conditions to be satisfied by a periodic function $f(t)$ for the existence of its Fourier series.	2
c.	What are initial conditions in a network? Explain importance of their determination in a network.	2
d.	Find whether following network function represent driving point immittance function? If not, List the errors. $F_1(S) = \frac{4S^4 + S^2 - 3S + 1}{S^3 + 2S^2 + 2S + 40}$	2
e.	What is meant by unit impulse function and find its Laplace Transform?	2
	II : PART - B	**90**
	UNIT - I	**18**
1 a.	In the network shown in Fig. 1(a), use nodal technique to determine i_x.	9

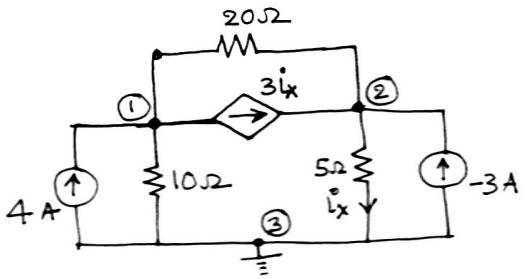

Fig .1(a)

b.	In the network shown in Fig. 1(b), use mesh equations to find the mesh currents i_1, i_2 and i_3 as assigned.	9

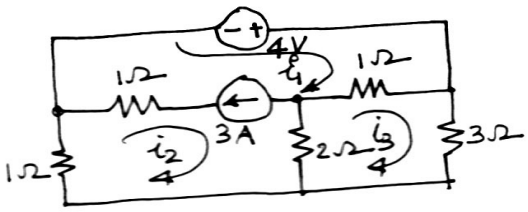

Fig .1(c).

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c. Find the Thevenin's equipment network across the terminals *A* and *B* of the network shown in Fig.1(c). 9

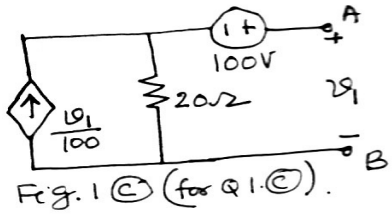

Fig. 1 © (for Q 1.©).

Fig .1(c).

UNIT - II

18

2 a. A series RLC circuit has $Q_0 = 5.1$ at its resonant frequency of 100 kHz. Assuming the power dissipation of the circuit is 100 W when drawing a current of 0.8 A, find; 9

i) RLC ii) Bandwidth Δf iii) Half power frequencies f_1 and f_2

b. Find the Fourier series for the waveform shown in Fig .2(b) Assume V = 10V, T = 1s. (Trigonometric Fourier series) 9

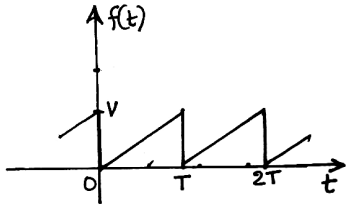

Fig. 2ⓑ.

c. A voltage given by V = 50+50sin (5000t) + 30sin (10000t) + 20sin(20000t) is applied to a circuit consisting of two elements in series. The current is; 9

I = 11.2 sin (5000t + 63.4°) + 10.6 sin (10000t + 45°) + 8.97sin (20000t +26.6°).

Find; i) Average power ii) Constants as parameter of the circuit.

UNIT - III

18

3 a. Fig. 3(a) shows a network with zero capacitor voltage and zero inductor current, when the switch *K* is open. At $t = 0$ the switch *K* is closed. Solve for;

i) $V_1$and V_2at $t = 0^+$ ii) $\frac{dV_1}{dt}$ and $\frac{dV_2}{dt}$ at $t = 0^+$ iii) V_1 and V_2 at $t = \infty$. 9

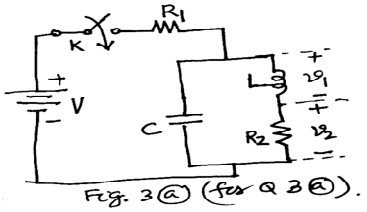

Fig. 3ⓐ (for Q 3ⓐ).

b. Fig. 3(b) shows a RLC parallel circuit excited by a dc current source. At $t = 0$, the switch *K* is opened. Find *V(t)*. 9

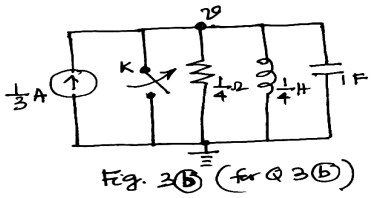

Fig. 3ⓑ (for Q 3ⓑ)

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c. Find the Laplace transform of the periodic saw tooth wave shown in Fig 3(c). 9

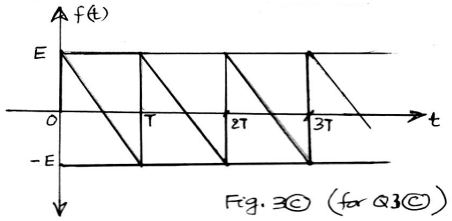

Fig. 3© (for Q3©)

UNIT - IV **18**

4 a. The h-parameter of a certain two port network are $h_{11} = 1\ \Omega$, $h_{12} = 2$, $h_{21} = -2$, $h_{22} = 1\mho$ Find; 9

i) Z-parameters ii) Y-parameters iii) ABCD parameters

Find whether the network is reciprocal, symmetrical.

b. A star connected 3-ϕ load has a resistance of 8 Ω and a capacitive reactance of 10 Ω in each phase. It is fed from a 400 V, 3-ϕ balanced supply. 9

i) Find the line current, total VA, active and reactive power ii) Draw Phasor diagram

c. A balanced delta connected/load shown in Fig.4(c) takes a line current of 15 A, when connected to a balanced 3-ϕ, 400 V system. A wattmeter with its current coil in one line and its pressure coil between the two remaining lines reads 2000 W. Describe the load impedance. 9

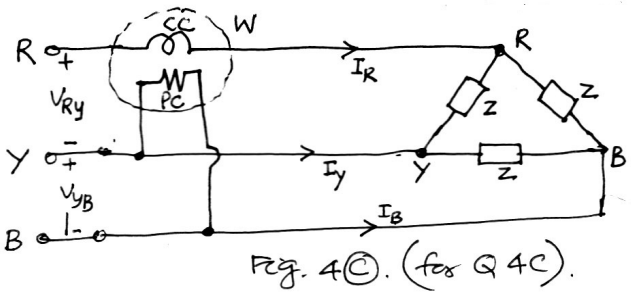

Fig. 4©. (for Q 4C).

UNIT - V

18

5 a. For the network shown in Fig. 5(a), find the driving point input impedance. Plot the Pole-Zero patterns of network shown. 9

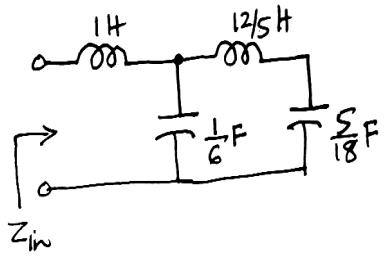

Fig. 5@ (for Q 5@).

b. Fig. 5(b) shows an RC circuit consisting of two capacitors and one resistance. 9

$C_1 = 10\ \mu F$, $C_2 = 40\ \mu F$ and $R = 0.5\ M\Omega$. There is initial change on C_1 such that voltage across its terminals is 200 V. At $t = 0$ the switch 'K' is closed.

i) Find time domain voltage expressions for voltages across the two capacitors

ii) Find the steady state voltages across these capacitors. Use Laplace transformation method.

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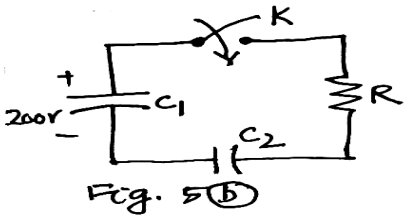

Fig. 5(b)

c. A series circuit has a resistance of 4 Ω and an inductance of 0.1 H as shown in Fig. 5(c). The switch K is closed at $t = 0$ by exciting the circuit by the voltage sources when,

i) Unit impulse V_g of δ(t-3) ii) A unit ramp voltage r(t-3)

Find the current *i(t)* for each source separately i.e. Taking one at a time. 9

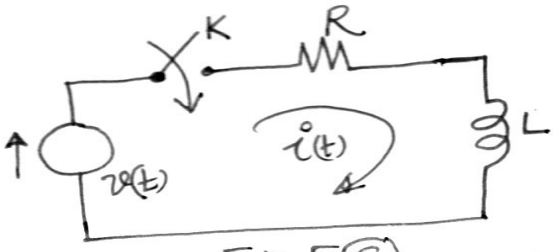

Fig. 5(c)

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