Marking scheme & solution

Total No. of Questions – [04] Total No. of Printed Pages 04

G.R. No.	

Paper code - U218-136 (T2)

OCTOBER 2018/IN-SEM (T2)
S. Y. B. TECH. (E & TC) (SEMESTER - I)

COURSE NAME:Network Theory

COURSE CODE: ETUA21176

(PATTERN 2017)

Time: [**1Hour**] [Max. Marks: **30**]

(*) Instructions to candidates:
1) Answer Q.1 OR Q.2 and Q.3 OR Q.4.
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed
4) Use suitable data wherever required

Q.1) a) A parallel resonant circuit has an inductor 0.1 H with quality factor 5. Determine the capacitance and the coil resistance at resonant frequency 100 Hz. Also find the impedance at resonance. [6 marks]

$Q_{ar} = \frac{\omega_{ar} L}{R_{coil}}$ $R_{coil} = 12.56\Omega$ **-2M**

$$f_{ar} = \frac{1}{2\pi}\sqrt{\frac{1}{LC} - \frac{R_{coil}^2}{L^2}}$$

$C = 24.35\ \mu F$ **-2M**

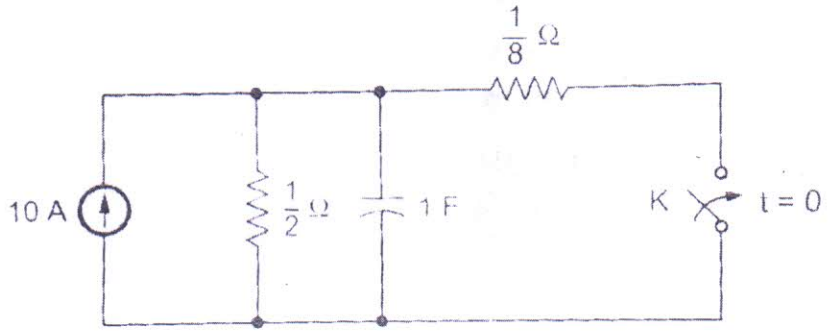
$Z_{ar} = \frac{L}{CR_{coil}} = 1.65\ M\Omega$ **– 2M**

b) A circuit consisting of a coil of inductance 0.4H with internal resistance 10 Ω, is connected in series with a capacitor. The circuit is driven by 230V, 50Hz AC source. Determine the capacitance, voltage across inductor and current in the circuit at resonance. [6 marks]

f_o=50 Hz Hence C_o= 25.33 μF -2 M
Q_0=12.56
V_L= jQ_0V = j2.89KV= $2.89\angle 90$ KV -2M
I_0= V/R= 23A -2M

c) An inductor of 0.05H and internal resistance 50Ω is connected in series with 0.02μF capacitor. Determine Quality factor and bandwidth [4 marks]

Q.3) a) In the network shown below the switch is open for long time. At t=0 the switch is closed. Determine the voltage across capacitor. [6 marks]



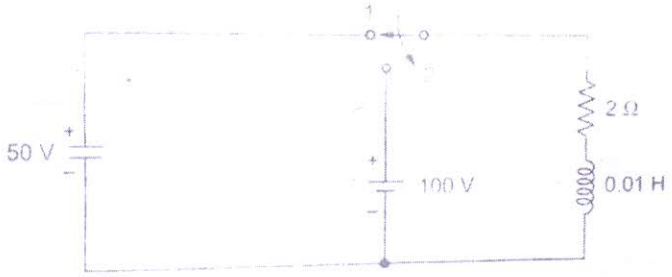
$V_c(0^-)$= 5 V - 2M

$V_c(t) = 1 + 4e^{-10t}$ V -4M

b) Explain the concept and physical significance of complex frequency [4 marks]

Concept and significance of complex frequency S for all three cases – 4 M

c) In the following circuit the switch is moved from position 1 to 2 at t=0. Prior to this the steady state was reached. Determine i(t) after switching . [4 marks]

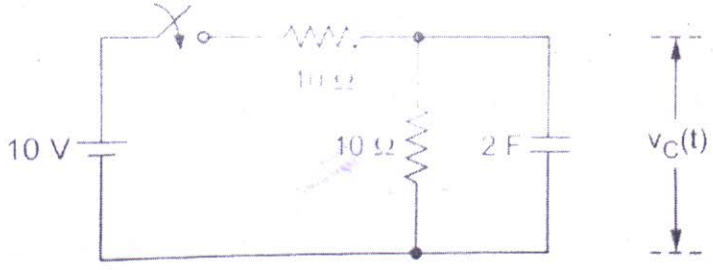


$i_L(0^-)$= 25A - 1M

$i_L(t) = 50 - 25e^{-200t}$ A -3M

OR

Q.4) The switch is closed at t=0. Find the voltage across capacitor. Draw its graph. [6 marks]



$V_c(t) = 5 - 5e^{-0.1t}$ V -4M graph 2M

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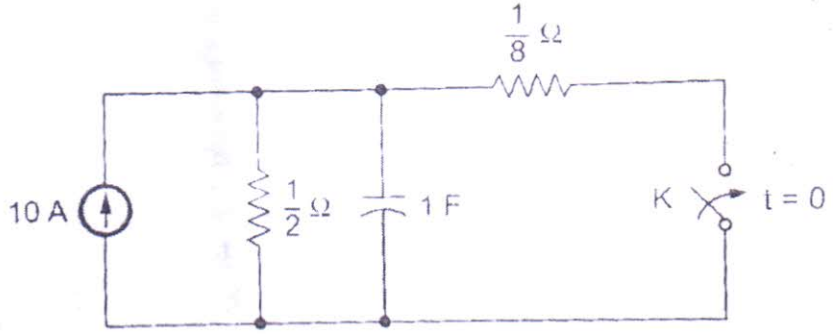

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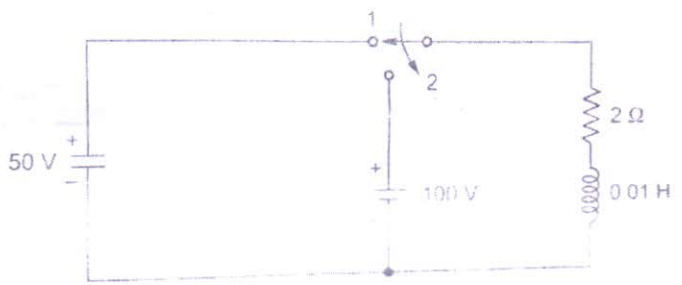

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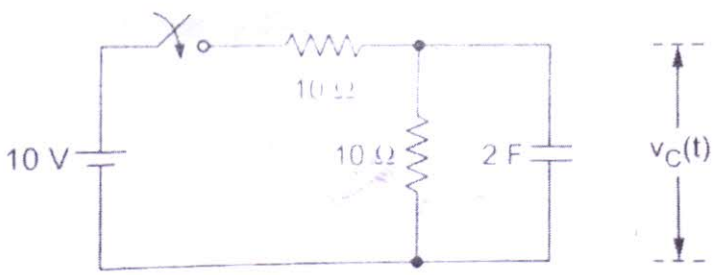

$V_c(t) = 5 - 5e^{-0.1t}$ V -4M graph 2M

b) Determine Laplace transform for the following functions 1) cos(ωt) 2) e^{-at} [4 marks]

$L\{\cos(\omega t)\} = \frac{s}{s^2+\omega^2}$ -2M

$L\{e^{-at}\} = \frac{1}{s+a}$ -2M

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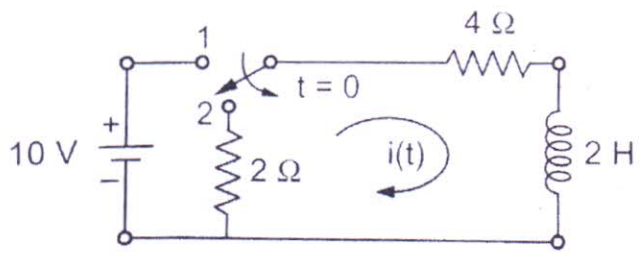

$i_L(0^-) = 2.5A$ - 1M

$i_L(t) = 2.5e^{-3t}$ A -3M