Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017

COURSE NAME	:	ELECTRIC CIRCUIT ANALYSIS II
COURSE CODE	:	BEF 12503
PROGRAMME CODE	:	BEV
EXAMINATION DATE	:	JUNE 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) With the help of appropriate illustration, explain the working principle of inductor.

(4 marks)

(b) Derive the expression for the current $i(t)$ flowing in the circuit of **Figure Q1(b)** after the switch S is closed at time, t = 0.

(5 marks)

(c) A 10 Vdc battery is switched across a coil of 1 H inductance and 40 Ω resistance as shown in **Figure Q1(b)**.

(i) Determine the current $i(t)$ flowing in the circuit.

(3 marks)

(ii) Calculate the resistor voltage, $V_R(t)$

(2 marks)

(iii) Calculate the inductor voltage, $V_L(t)$

(2 marks)

(iv) Find the instantaneous power, $p(t)$ and the energy stored, $e(t)$ in an inductor at t = 0.2s

(4 marks)

Q2 (a) The switch in the **Figure Q2(a)** has been closed for a long time, and it is opened at t=0,

(i) Find the voltage across the capacitor, $v(t)$ for t>0

(3 marks)

(ii) Find the initial energy stored in the capacitor, $e(t)$

(3 marks)

(iii) Calculate the initial energy stored in the capacitor when C change to 50mF

(5 marks)

(iv) Conclude the relationship the initial energy and the value of capacitor based on the results obtained in **Q2(a)(ii)** and **Q2(a)(iii)**

(3 marks)

(b) The switch in the **Figure Q2(b)** has been closed for a long time. At t=0, the switch is opened. Calculate the current through a inductor, $I_{LI}(t)$ when

(i) t < 0

(3 marks)

(ii) t > 0

(3 marks)

Q3 (a) A series circuit which consists of a resistance, R = 500 Ω, an inductance, L= 0.25H, and a capacitance, 400μF is connected to a 240 V, 50 Hz single-phase supply,

(i) Sketch the phasor domain circuit

(4 marks)

(ii) Calculate the total impedance, Z_{total} of the circuit

(3 marks)

(iii) Analyze the voltage source, Vs, dan voltage drop across component : V_R, V_L and V_C of the circuit.

(8 marks)

(iv) Construct the phase angle of the circuit

(3 marks)

(v) Conclude the relationship of phasor current and the voltage supply based on the result obtained in **Q3(a)(iv)**

(2 marks)

Q4 (a) A sinusoidal waveform of single-phase AC voltage supply is defined as $v_s(t) = 311\sin(314t)\,V$ as shown in **Figure Q4(a)** connected to a linear circuit.

(i) Find the complex impedance of the inductor, Z_L and the capacitor, Z_C.

(2 marks)

(ii) Draw the phasor domain circuit.

(2 marks)

(iii) Use the Voltage Divider Rule, to determine the capacitor voltage, V_C (t).

(3 marks)

(iv) Use the Ohms Law, calculate the $i_R(t)$, $i_C(t)$ and $i(t)$.

(3 marks)

(b) A single-phase sinusoidal current supply is connected to passive elements as shown in **Figure Q4(b)**

(i) Determine the complex impedance of the inductor and the capacitor

(2 marks)

(ii) Construct the phasor domain circuit

(2 marks)

(iii) Use the Current Divider Rule, find the output current $i_0(t)$

(2 marks)

(iv) Calculate the $i_1(t)$ of the circuit

(2 marks)

(v) Illustrate the phasor angle of the circuit

(2 marks)

Q5 (a) (i) Draw the circuit of purely capacitive load and describe an expression of $v(t)$, $i(t)$ and $p(t)$

(5 marks)

(i) Illustrate the V-I phase diagram for purely capacitive load

(1 mark)

(ii) Illustrate the V-I sine wave diagram and power wave diagram for purely capacitive load

(2 marks)

(b) An impedance of $(14 + j5)\ \Omega$ is connected in parallel with an impedance of $(12 - j8)\ \Omega$. This combination is then connected in series with an impedance of $(10 + j12)\ \Omega$. If the whole circuit connected across a 100 V_{ac}, 50 Hz supply.

(i) Draw phasor circuit and calculate the total load impedance

(3 marks)

(ii) Calculate the value of supply current

(1 marks)

(iii) Calculate the active power consumed by the circuit

(3 marks)

(iv) Calculate the reactive power consumed by the circuit

(2 marks)

(v) Calculate the power factor of the circuit

(2 marks)

- END OF QUESTIONS –

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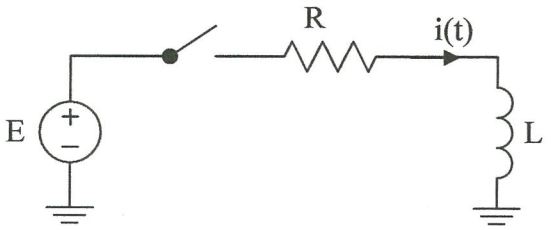

FIGURE Q1(b)

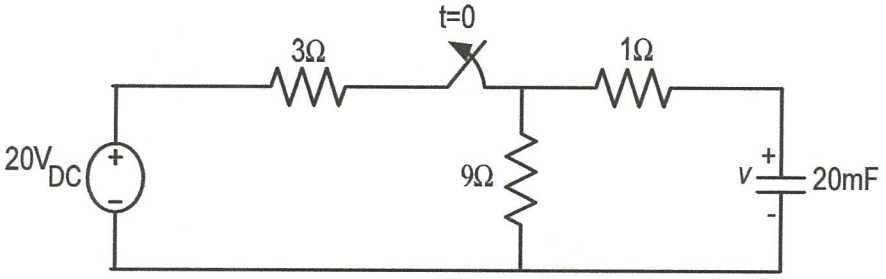

FIGURE Q2(a)

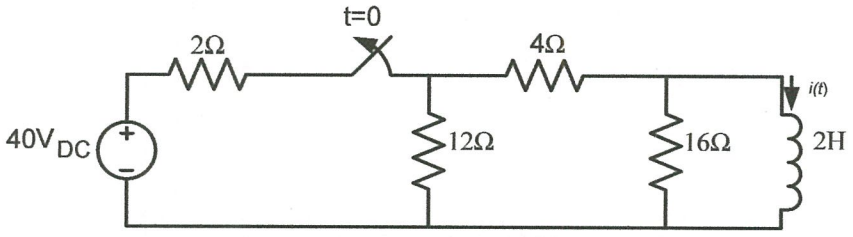

FIGURE Q2(b)

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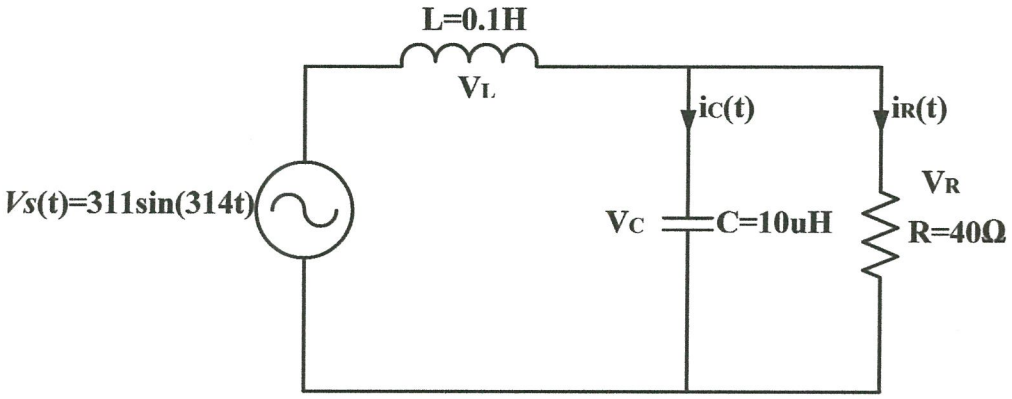

FIGURE Q4(a)

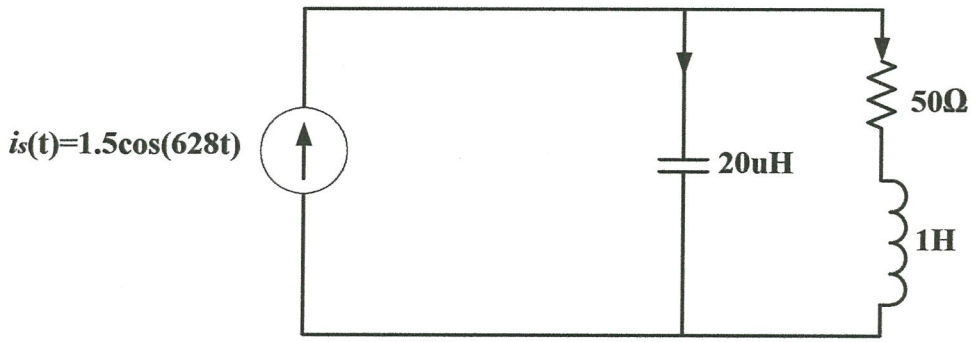

FIGURE Q4(b)