Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2014/2015

COURSE NAME	:	CIRCUIT THEORY
COURSE CODE	:	DAE 11103
PROGRAMME	:	1 DAE
EXAMINATION DATE	:	JUNE 2015 / JULY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	PART A ANSWER **ALL** QUESTIONS PART B ANSWER **TWO (2)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

PART A

Q1 (a) Determine the current flowing through an element if the charge flow is given by

$$q(t) = (3e^{-t} - 5e^{-2t})\ nC$$

(4 marks)

(b) Find the charge *q(t)* flowing through a device if the current is

$$i(t) = 10e^{-30t} \sin 40t\ A, \qquad q(0) = 0$$

(6 marks)

(c) If R_{eq} = 50 Ω in the circuit of **Figure Q1(c)**, find *R*.

(10 marks)

Q2 (a) In the circuit of **Figure Q2(a)**, find the voltage V_o using nodal analysis.

(10 marks)

(b) In the circuit of **Figure Q2(b)**, find the voltage V_x using mesh analysis.

(10 marks)

Q3 (a) Use source transformations to reduce the circuit in **Figure Q3(a)** to a single voltage source in series with a single resistor.

(6 marks)

(b) Find the Thevenin equivalent circuit at the terminal *a-b* shown in **Figure Q3(b).**

(6 marks)

(c) Find V_o in the circuit of **Figure Q3(c)** using Norton's theorem.

(8 marks)

PART B

Q4 (a) Define the meaning of time constant, τ with the aid of appropriate graph.

(4 marks)

(b) Determine the equivalent capacitance, C_{eq} seen from terminal *a-b* in **Figure Q4(b).**

(4 marks)

(c) The switch in the circuit shown in **Figure Q4(c)** has been closed for a long time and is opened at $t = 0$. Find

(i) the initial value of $v(t)$
(ii) the time constant for $t > 0$
(iii) the numerical expression for $v(t)$ after the switch has been opened
(iv) the initial energy stored in the capacitor, $w_c\ (0)$.

(12 marks)

Q5 (a) Suppose that the ac line voltage powering a computer has an rms value of 110 V, a frequency of 60 Hz, and the peak voltage is attained at t = 5ms. Write an expression for this ac voltage as a function of time.

(4 marks)

(b) Suppose that

$$v_1(t) = 20 \cos(\omega t - 45^o)$$
$$v_2(t) = 10 \sin(\omega t + 60^o)$$

Reduce the sum $v_s(t) = v_1(t) + v_2(t)$ to a single trigonometric function.

(6 marks)

(c) Consider the circuit shown in **Figure Q5(c)**. Find the voltage $v_C(t)$ in steady state condition. Find the phasor current through each element.

(10 marks)

Q6 (a) A 110 V rms, 60 Hz source is applied to a load impedance Z. The apparent power entering the load is 120 VA at a power factor of 0.707 lagging.

(i) Calculate the complex power.
(ii) Find the rms current supplied to the load.
(iii) Determine Z.
(iv) Assuming that $Z = R + j\omega L$, find the values of R and L.

(12 marks)

(b) A 50 kW load operates from a 60 Hz 10 kV_{rms} line with a power factor of 60% lagging. Compute the capacitance that must be placed in parallel with the load to achieve a 90% lagging power factor.

(8 marks)

- END OF QUESTION -

FINAL EXAMINATION

SEMESTER/SESSION: SEM II/2014/2015 PROGRAMME : 1 DAE
COURSE NAME : CIRCUIT THEORY COURSE CODE : DAE 11103

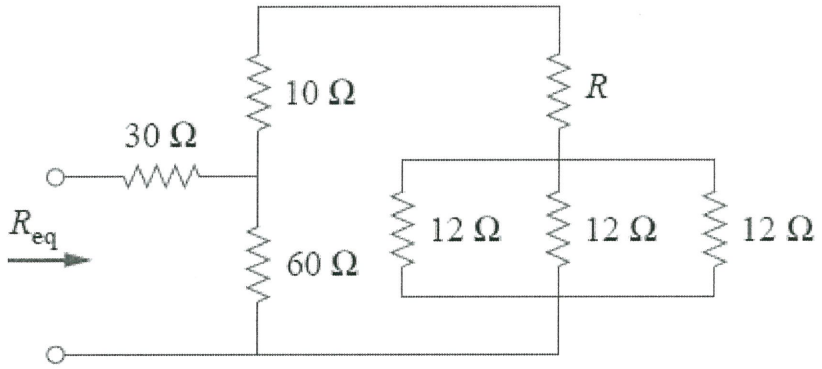

FIGURE Q1(c)

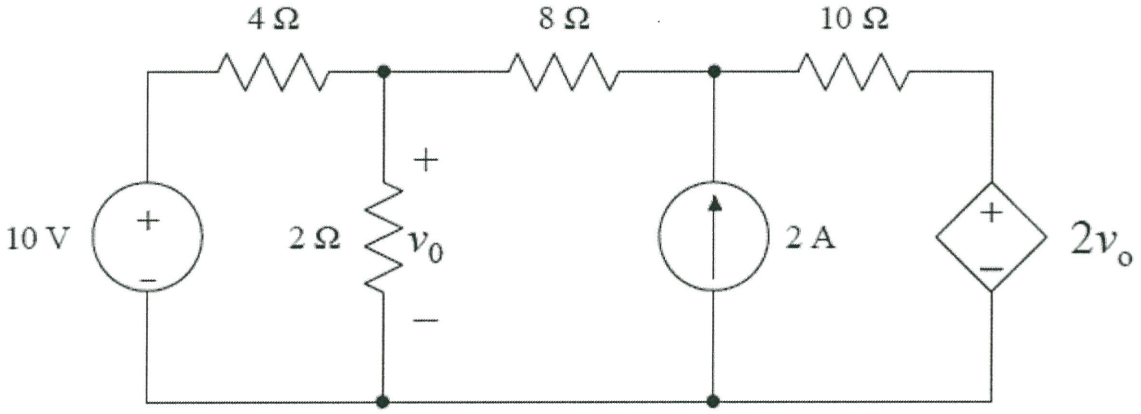

FIGURE Q2(a)

FINAL EXAMINATION

SEMESTER/SESSION: SEM II/2014/2015 PROGRAMME : 1 DAE
COURSE NAME : CIRCUIT THEORY COURSE CODE : DAE 11103

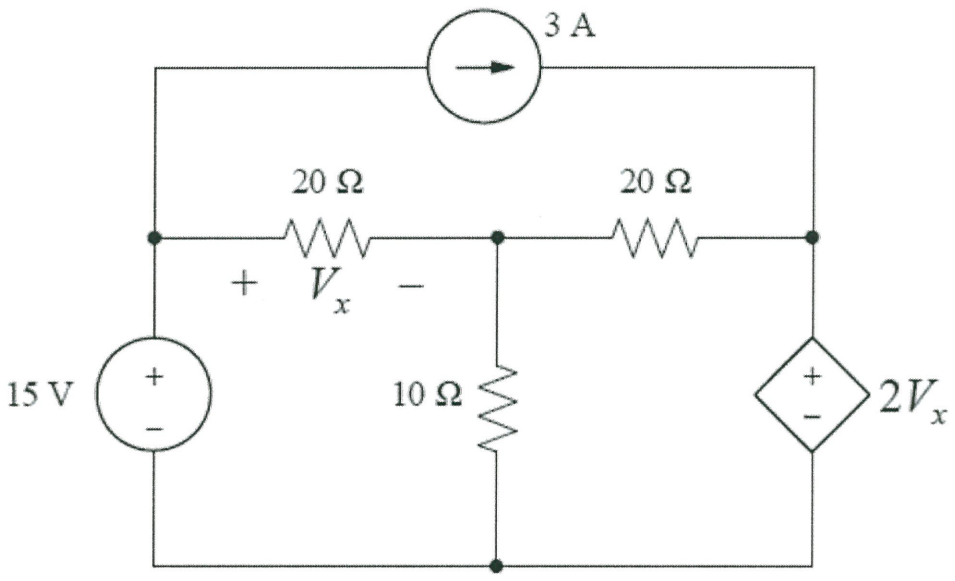

FIGURE Q2(b)

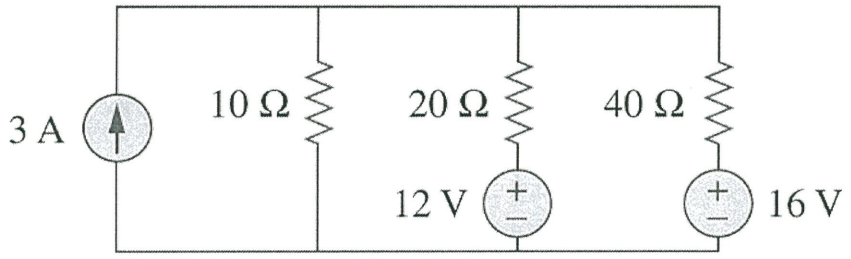

FIGURE Q3(a)

FINAL EXAMINATION

SEMESTER/SESSION: SEM II/2014/2015 PROGRAMME : 1 DAE
COURSE NAME : CIRCUIT THEORY COURSE CODE : DAE 11103

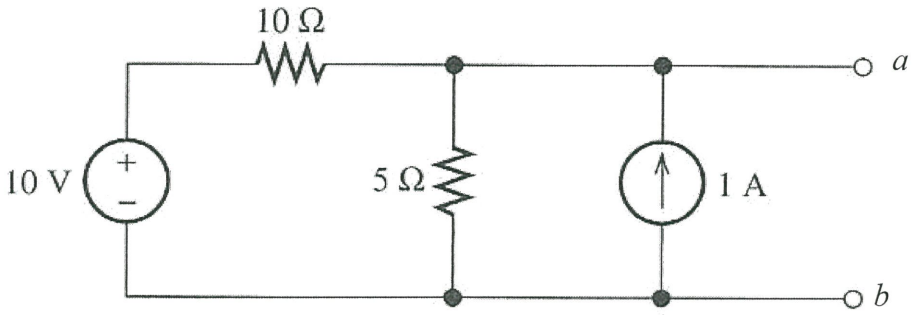

FIGURE Q3(b)

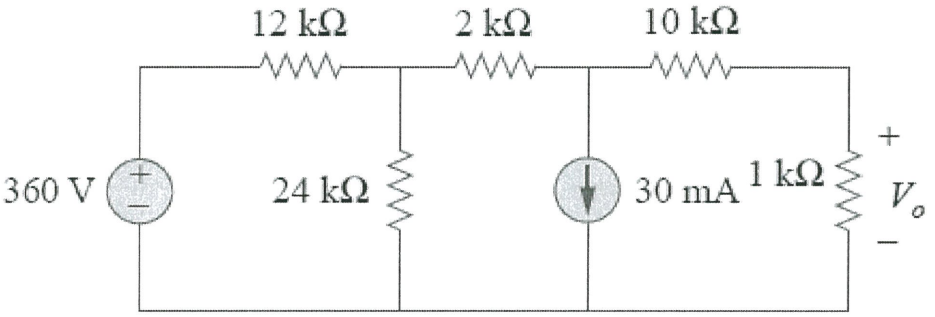

FIGURE Q3(c)

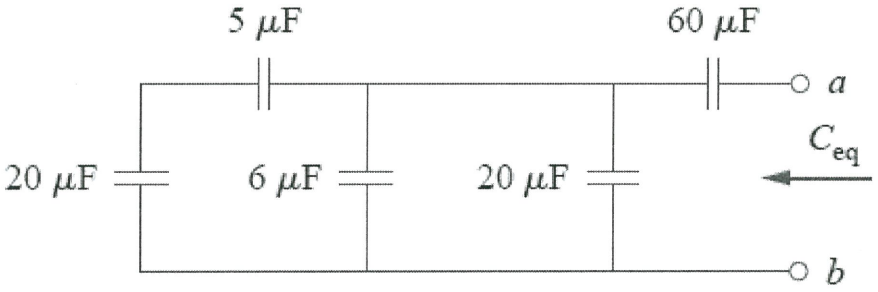

FIGURE Q4(b)

FINAL EXAMINATION

SEMESTER/SESSION: SEM II/2014/2015 PROGRAMME : 1 DAE
COURSE NAME : CIRCUIT THEORY COURSE CODE : DAE 11103

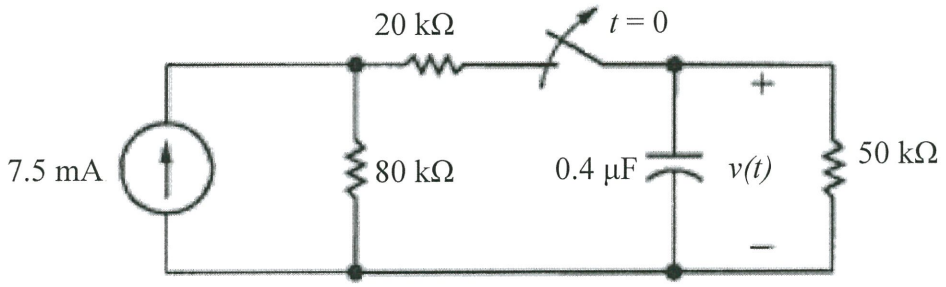

FIGURE Q4(c)

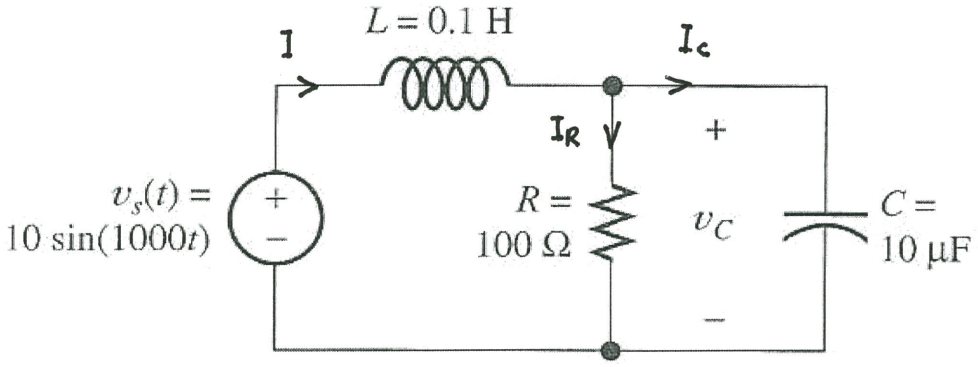

FIGURE Q5(c)