Universiti Tun Hussein Onn Malaysia

# UNIVERSITI TUN HUSSEIN ONN MALAYSIA

## FINAL EXAMINATION
## SEMESTER II
## SESSION 2015/2016

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|---|---|---|
| COURSE NAME | : | ELECTRIC CIRCUITS |
| COURSE CODE | : | BEL 10103 |
| PROGRAMME | : | BEJ |
| EXAMINATION DATE | : | JUNE / JULY 2016 |
| DURATION | : | 3 HOURS |
| INSTRUCTION | : | ANSWER ALL QUESTIONS. |

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Refer to **Figure Q1(a)**;

(i) Find equivalent resistance $R_{eq}$ and total current, $I_s$ for this circuit if terminal a – b is open circuited. (Hint: Use source transformation method)

(8 marks)

(ii) Derive the Thevenin and Norton equivalent circuit at terminal a – b. Show all calculations.

(8 marks)

(b) Explain the method for obtaining Thevenin resistance.

(4 marks)

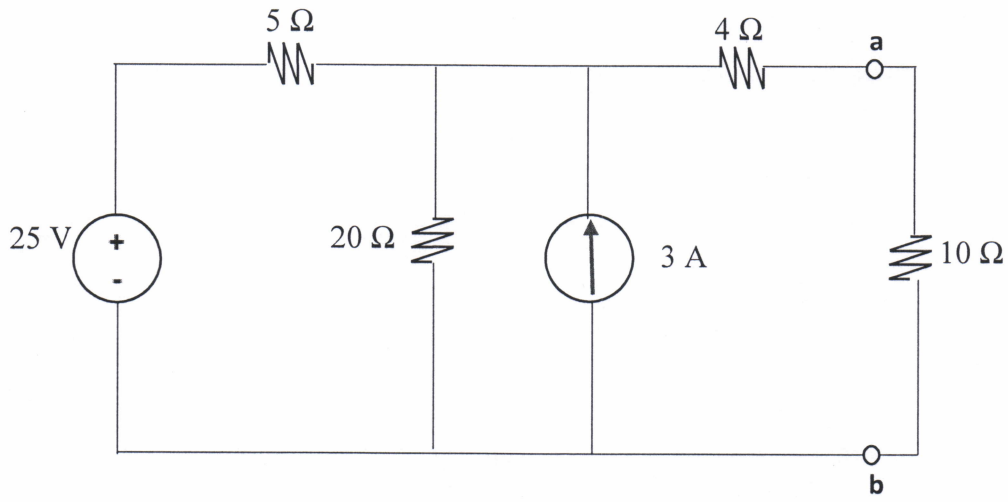


**Figure Q1(a)**

Q2 (a) For circuit in **Figure Q2(a)**;

(i) Calculate the equivalent resistance at node C- D.

(6 marks)

(ii) Find the equivalent resistance $R_{AD}$ at terminal A - D.

(6 marks)

(b) Distinguish dependent and independent source.

(4 marks)

(c) Suggest **TWO (2)** circuit elements using dependent source in its systems.

(4 marks)

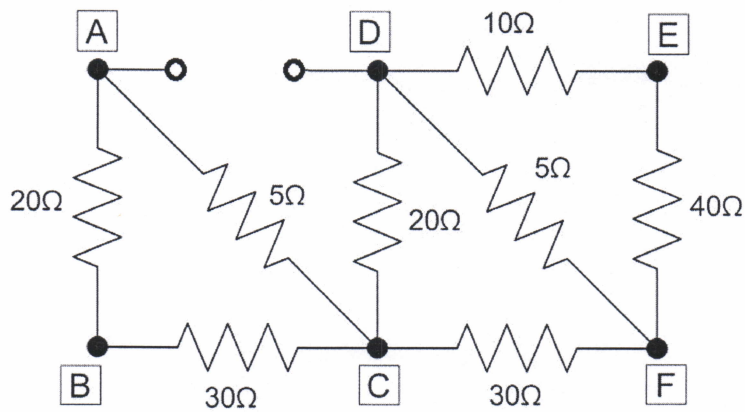


**Figure Q2(a)**

Q3 (a) Define the Kirchoff's current law (KCL) and voltage law (KVL).

(4 marks)

(b) Determine $i_1$, $i_2$ and $i_3$ using mesh analysis for **Figure Q3(b)**.

(12 marks)

(c) Differentiate between a supernode and supermesh.

(4 marks)

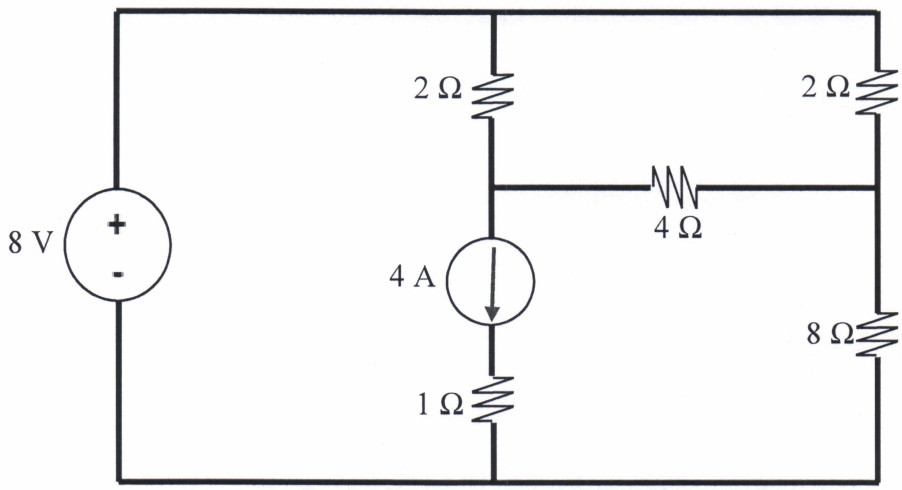


**Figure Q3(b)**

Q4 (a) A 1 mH inductor connected in a telephone circuit is found to have a voltage across it as shown in **Figure Q4(a).** The initial inductor current is given by i(0) = 10 mA.

(i) Find the current expression for t > 0 ms.

(8 marks)

(ii) Determine the initial energy in the inductor at t = 0 ms.

(2 marks)

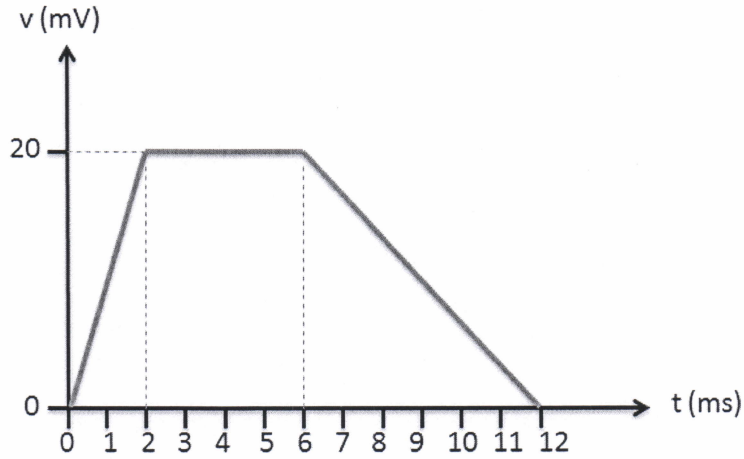


**Figure Q4(a)**

(b) Three capacitors, $C_1$ = 10μF, $C_2$ = 10μF and $C_3$ = 20μF, are connected in parallel across a 100V DC source. Determine:

(i) the total capacitance.

(3 marks)

(ii) the charge on each capacitor.

(3 marks)

(iii) the total energy stored in the parallel combination of the capacitors.

(4 marks)

**Q5** (a) **Figure Q5(a)** shows the RC circuit:

(i) If the switch has been open for a long time and is closed at $t$=0, find $v_o(t)$ and $i(t)$.

(7 marks)

(ii) If the switch has been closed for a long time and is opened at $t$=0, find $v_o(t)$ and $i(t)$.

(6 marks)

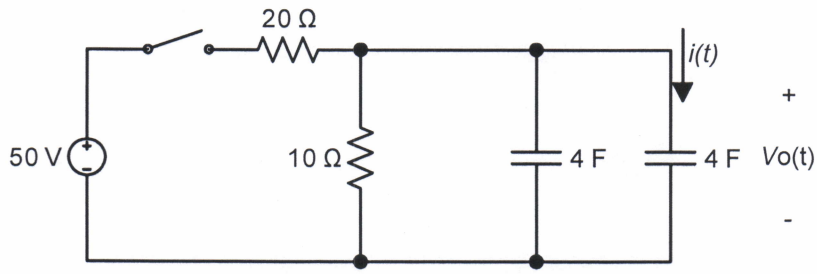


**Figure Q5(a)**

(b) **Figure Q5(b)** shows the spark coil of an ignition system:

(i) Calculate the value of resistor, R, if the time needed for the coil to fully charge is 10ms when ignition switch is closed.

(2 marks)

(ii) Evaluate the steady state current when ignition switch is closed and draw the current response.

(2 marks)

(iii) If the switch takes 1μs to open, calculate the voltage developed across the spark gap and the energy stored in the coil.

(3 marks)

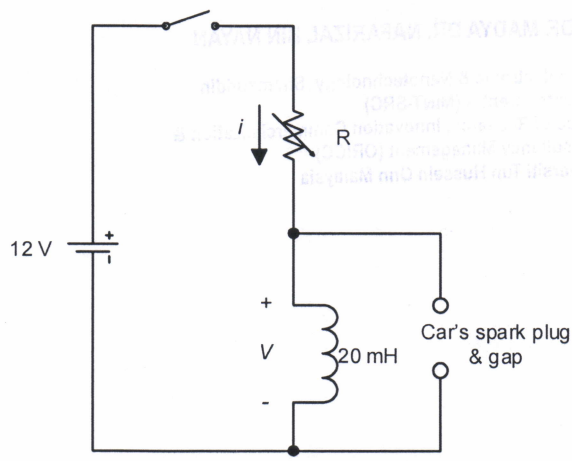


**Figure Q5(b)**

**-END OF QUESTIONS-**