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Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2016/2017**

COURSE NAME : ELECTRIC CIRCUIT ANALYSIS I  
COURSE CODE : BEF12403  
PROGRAMME : BEV  
EXAMINATION DATE : DECEMBER 2016/JANUARY 2017  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS

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

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**Q1** Define the following concepts. Use an appropriate diagram or equation to support your explanation.

- (a) Kirchoff's Voltage Law (KVL) (2 marks)
- (b) Active element (2 marks)
- (c) Series circuit (2 marks)
- (d) Short circuit (2 marks)
- (e) Supernodes (2 marks)

**Q2** (a) State the name of liquid that is a good conductor of electricity. (2 marks)

(b) When a car has a dead battery, it can often be started by connecting the live battery from another car to the terminals of the dead battery. The connection is shown in **Figure Q2(b)**. The current  $I$  is measured and found to be 24 A.

(i) Determine which one is the dead battery. (1 mark)

(ii) If the good battery has a voltage of 12.6 V, calculate the energy (in joules) that will be transferred to the dead battery per minute. (3 marks)

(c) Based on **Figure Q2(c)**, determine the total resistance at A – B terminals if the conductance of each resistor is 250  $\mu$ S. (5 marks)

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- Q3** (a) With mesh analysis, calculate the value of  $i_y$  in **Figure Q3(a)**. (12 marks)
- (b) Calculate the values of  $i_o$  and  $i_x$  using nodal analysis for the circuit in **Figure Q3(b)**. (12 marks)
- Q4** An equivalent circuit for a Field Effect Transistor (FET) common-source amplifier or Bipolar Junction Transistor (BJT) common-emitter amplifier can be modeled by the circuit shown in **Figure Q4**.
- (a) Determine the expression for the gain of the amplifier, which is the ratio of the output voltage,  $v_o(t)$  to the input voltage,  $v_i(t)$ . (15 marks)
- (b) Calculate the magnitude of the gain expressed in Q4(a), if  $g_m = 0.04$  S,  $R_1 = 100 \Omega$ ,  $R_2 = 1 \text{ k}\Omega$ ,  $R_3 = 50 \text{ k}\Omega$  and  $R_4 = R_5 = 10 \text{ k}\Omega$  (4 marks)
- Q5** (a) Find  $i_s$  for the circuit in **Figure Q5(a)** using the superposition theorem. (8 marks)
- (b) **Figure Q5(b)** shows a circuit and its Norton's equivalent circuit. Prove that  $R_N = 50 \Omega$  and  $I_N = -0.1$  A at A – B terminals. (13 marks)
- (c) The maximum power transfer theorem states that the maximum power delivered to a load by a source is attained when the load resistance,  $R_L$ , is equal to the Thevenin resistance,  $R_{th}$ , of the source. Using the circuit shown in **Figure Q5(c)**, prove that the maximum power delivered to  $R_L$  is given by

$$P_{\text{maximum}} = \frac{V_{th}^2}{4 R_L}$$

(15 marks)

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- END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER/SESSION : SEM I/ 2016/2017 PROGRAMME : BEV  
COURSE : ELECTRIC CIRCUIT ANALYSIS I CODE : BEF12403

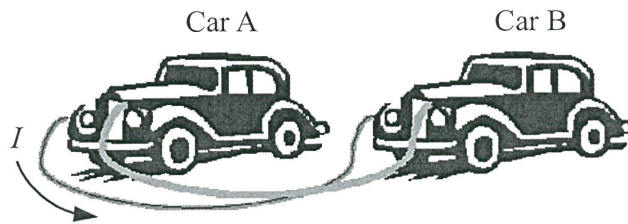


Figure Q2(b)

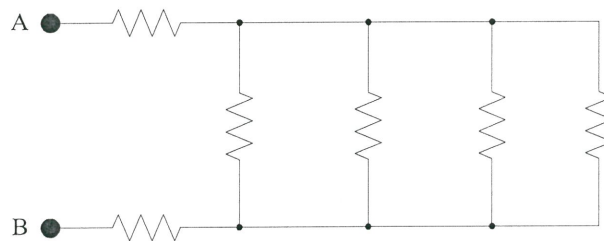


Figure Q2(c)

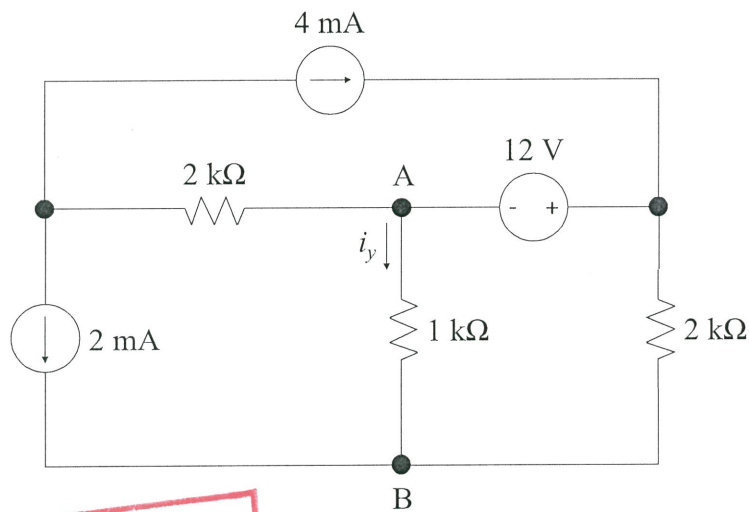


Figure Q3(a)

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FINAL EXAMINATION

SEMESTER/SESSION : SEM I/ 2016/2017 PROGRAMME : BEV  
 COURSE : ELECTRIC CIRCUIT ANALYSIS I CODE : BEF12403

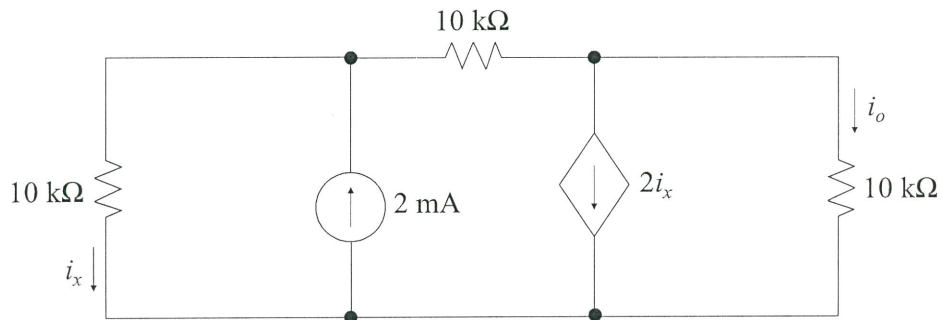


Figure Q3(b)

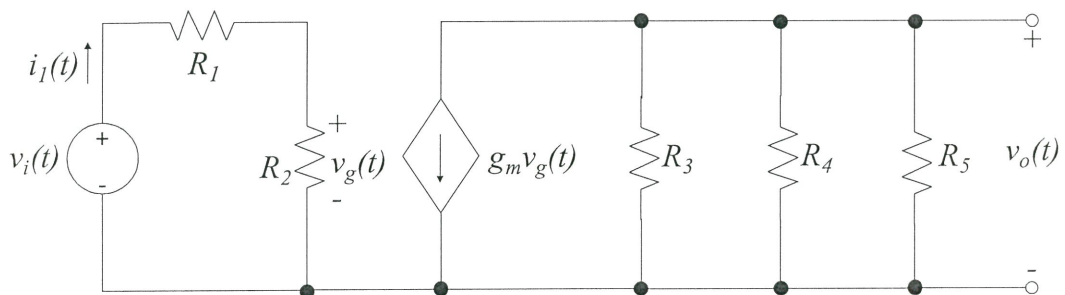


Figure Q4

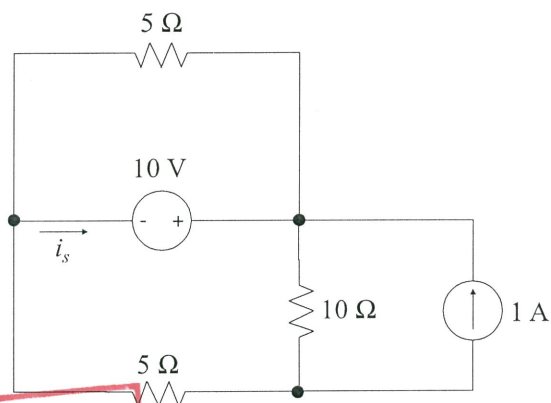


Figure Q5(a)

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SEMESTER/SESSION : SEM I/ 2016/2017 PROGRAMME : BEV  
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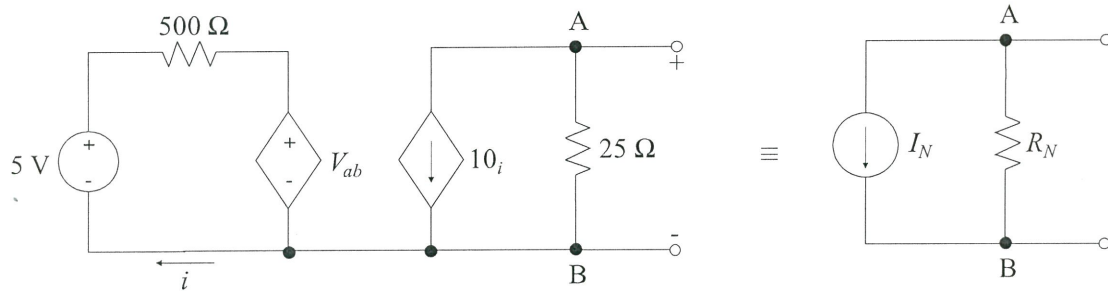


Figure Q5(b)

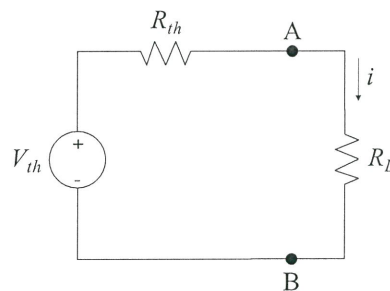


Figure Q5(c)

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