



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020**

COURSE NAME : ELECTRICAL PRINCIPLES I
COURSE CODE : BNR 10203
PROGRAMME CODE : BND/ BNE/ BNF
EXAMINATION DATE : DECEMBER 2019 / JANUARY 2020
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

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

- Q1** (a) Differentiate the following concepts. Use an appropriate diagram or equation to support your explanation.
- (i) Active and passive elements (3 marks)
 - (ii) Kirchhoff current and voltage laws (3 marks)
 - (iii) Conductor and semiconductor (3 marks)
 - (iv) Branches and nodes (3 marks)
- (b) Consider the circuit shown in **Figure Q1(b)** with $v = 8e^{-t}$ V and $i = 20e^{-t}$ A for $t \geq 0$. Compute the power supplied by this element and the energy supplied by the element over the first second of operation. Assume that v and i are zero for $t < 0$. (8 marks)
- Q2** (a) Determine the equivalent resistance R_{eq} for **Figure Q2(a)**. (5 marks)
- (b) Calculate the value of V_x for the circuit in **Figure Q2(b)**, by using nodal analysis. (7 marks)
- (c) Determine the current i_o in the circuit of **Figure Q2(c)** by using mesh analysis. (8 marks)
- Q3** (a) Compute the value of I_x in **Figure Q3(a)** by using superposition theorem. (8 marks)
- (b) For the circuit in **Figure Q3(b)**,
- (i) Obtain the Thevenin equivalent circuit at terminal a-b (4 marks)
 - (ii) Calculate the current through $R_L = 8\Omega$. (3 marks)
 - (iii) Estimate the value of R_L so that maximum power deliverable to R_L (2 marks)
 - (iv) Solve the maximum power. (3 marks)

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- Q4** (a) Multiple Choice Questions (Select all that apply)
- (i) The two input terminals of an op amp are labeled as:
- (a) high and low.
 - (b) positive and negative.
 - (c) inverting and noninverting.
 - (d) differential and nondifferential
- (1 marks)
- (ii) For an ideal op amp, which of the following statements are not true?
- (a) The differential voltage across the input terminals is zero.
 - (b) The current into the input terminals is zero.
 - (c) The current from the output terminal is zero.
 - (d) The input resistance is zero.
 - (e) The output resistance is zero.
- (2 marks)
- (iii) Which of these amplifiers is used in a digital-to-analog converter?
- (a) noninverter
 - (b) voltage follower
 - (c) summer
 - (d) difference amplifier
- (1 marks)
- (iv) Difference amplifiers are used in (please check all that apply):
- (a) instrumentation amplifiers
 - (b) voltage followers
 - (c) voltage regulators
 - (d) buffers
 - (e) summing amplifiers
 - (f) subtracting amplifiers
- (2 marks)
- (b) In the circuit of **Figure Q4(b)**, analyze the output value for v_o and i_o .
- (6 marks)
- (c) Compute v_o in the op amp circuit of **Figure Q4(c)**.
- (8 marks)

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- Q5** (a) Determine $i(t)$ and $v_L(t)$ given $i(0) = 4\text{A}$ for the circuit in **Figure Q5(a)**. (5 marks)
- (b) A voltage of $60 \cos(4\pi t)\text{V}$ appears across the terminals of a 3 mF capacitor. Analyze the current through the capacitor and the energy stored in it from $t = 0$ to $t = 0.125\text{ s}$. (8 marks)
- (c) Compute v_c , i_L and energy stored in the capacitor and inductor in the circuit of **Figure Q5(c)** under DC conditions. (7 marks)

- END OF QUESTIONS -

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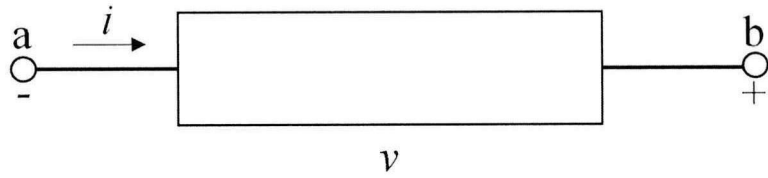


Figure Q1 (b)

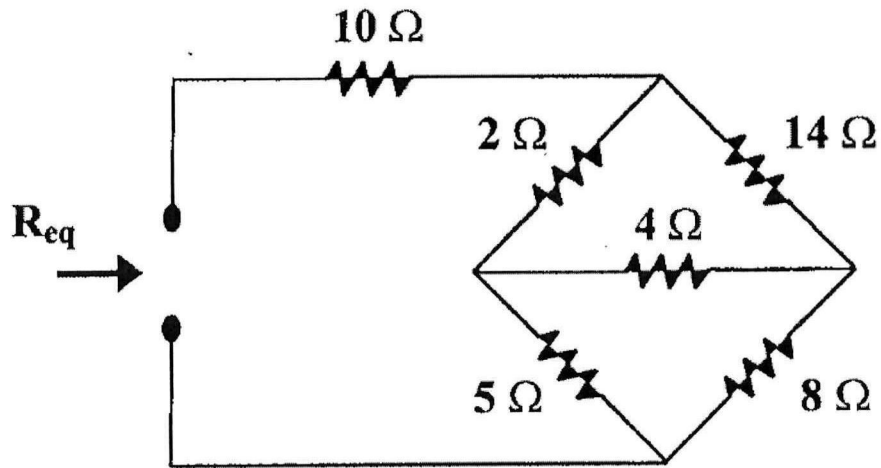


Figure Q2(a)

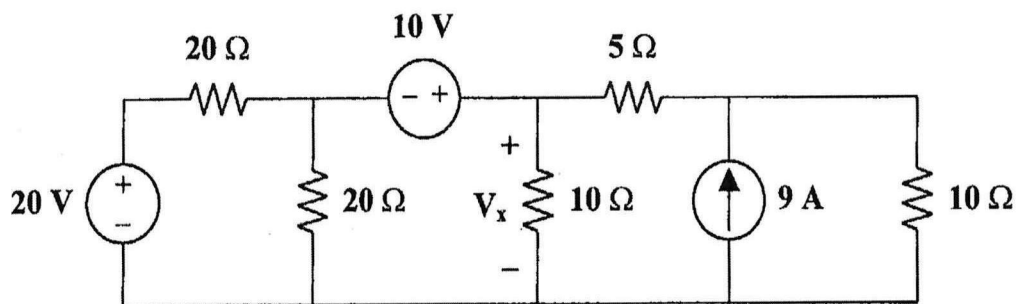


Figure Q2(b)

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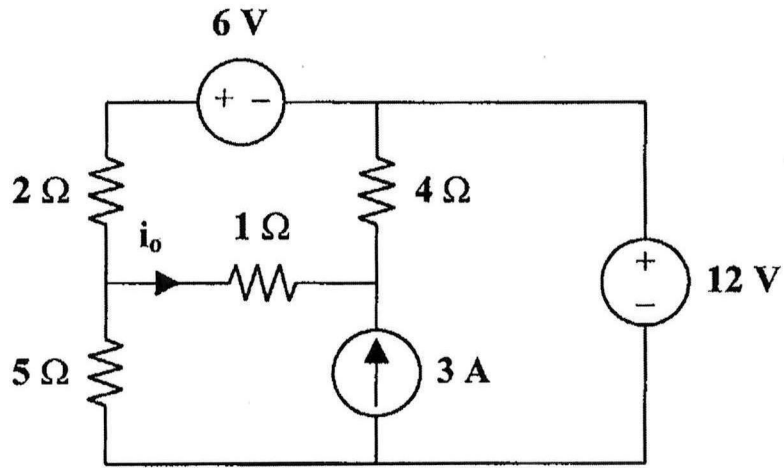


Figure Q2 (c)

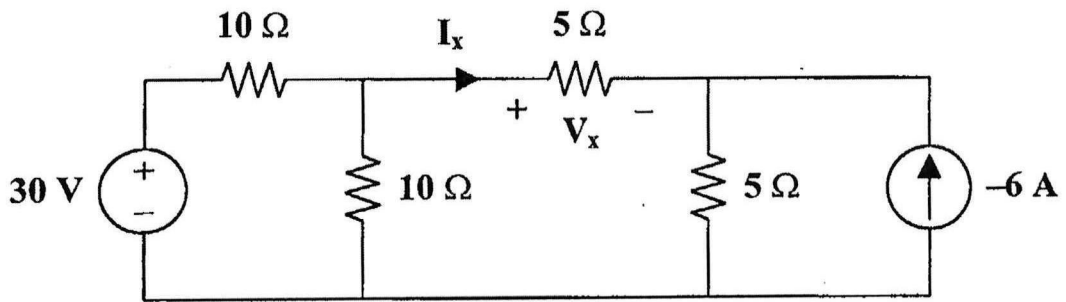


Figure Q3(a)

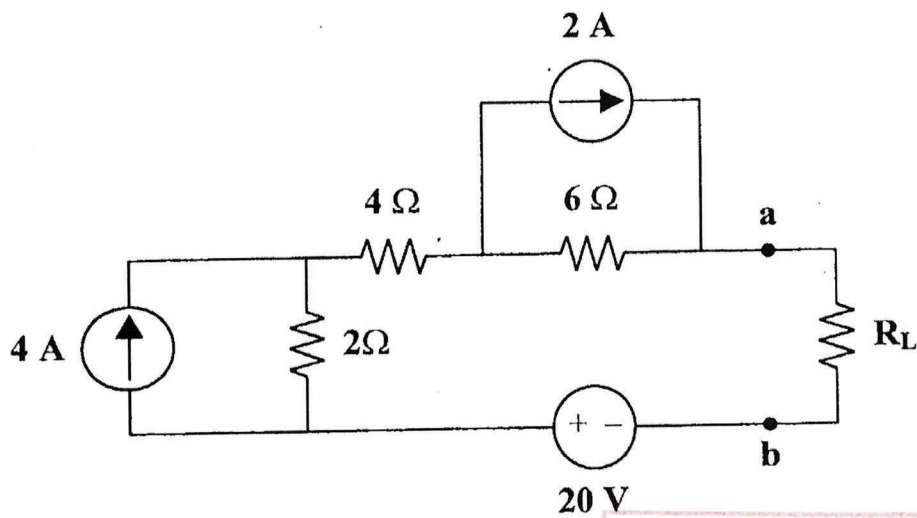


Figure Q3(b)

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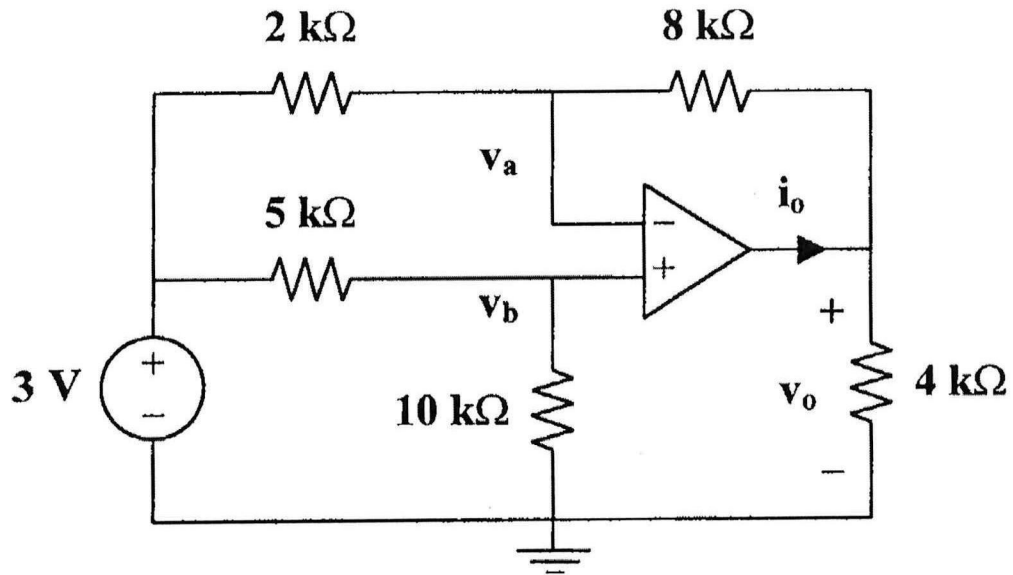


Figure Q4 (b)

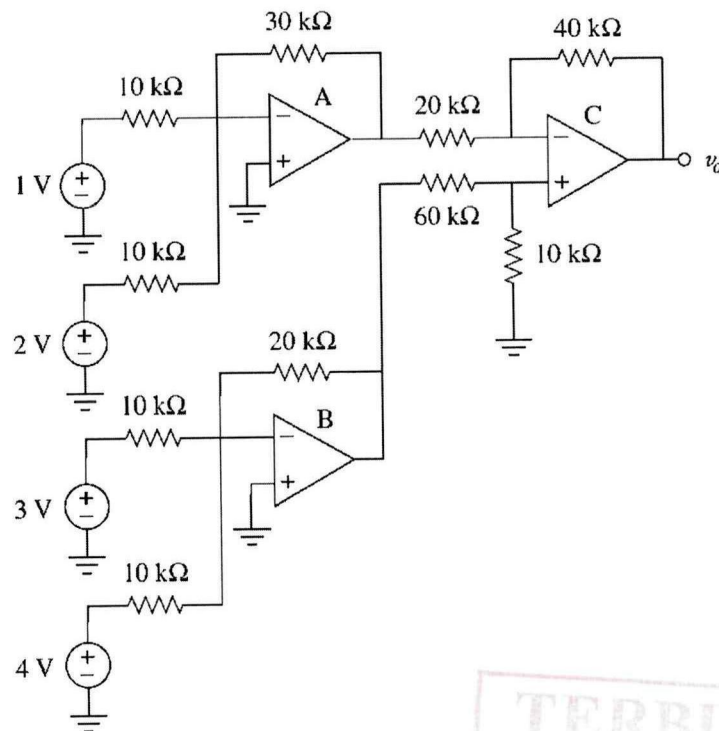


Figure Q4(c)

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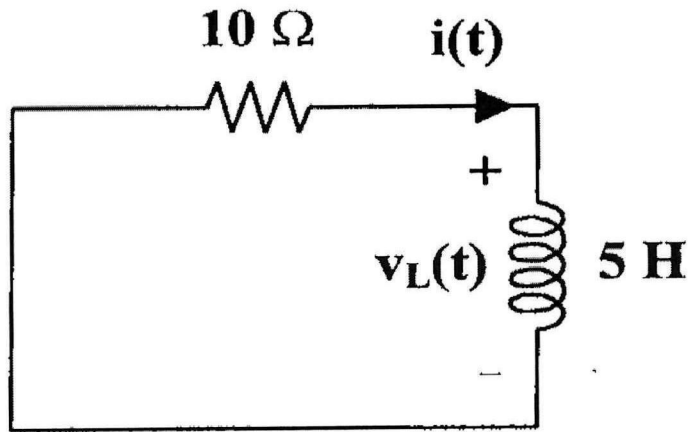


Figure Q5 (a)

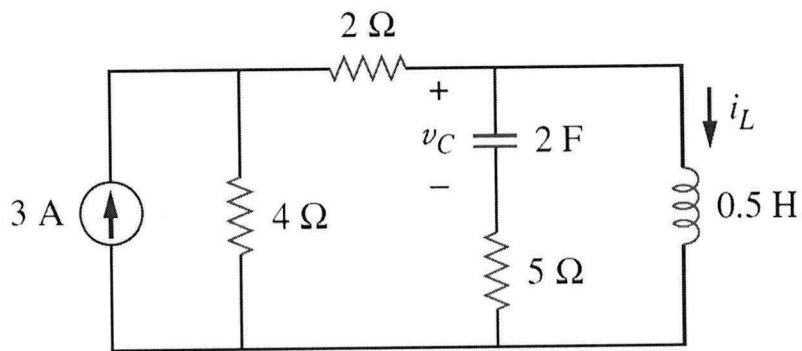


Figure Q5(c)

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