



**FINAL
ALTERNATIVE ASSESSMENT**

(COVER PAGE)

Session : April 2021

Programme : Diploma in Electrical & Electronic Engineering (DEEI)

Course : EEE1105: Circuit Theory & Electronic Devices

Date of Examination : 28 July 2021 (Wednesday)

Time : 8.00am – 11.00am Reading Time : Nil

Duration : 3 Hours

Special Instructions :

This paper consists of **FOUR (4)** questions. All the questions carry equal marks.

Answer script Blackboard submission requirement:

- Submit your softcopy answer script **ONE** time only to Blackboard.
- Write on top of each page of the answer script student Inti ID or name, subject code and page number. *Example: P20209539 / EEE1105 / Page 2 of 5.*
- Arrange your answer in proper order, scan the answer scripts and submit it to Blackboard within the given examination allocated time. Late submission is **NOT** allowed.
- Use a proper scanner or CamScanner on your mobile for scanning. Combine all pages in **ONE PDF file** for submission to Blackboard. Filename: **EEE1105 Final Exam (Name).PDF**
- Make sure pages of answer script are scanned with the good contrast and readable quality. Marking will be based on the scanned document as final.

Material permitted : Non-Programmable Scientific Calculator

Materials provided : Nil

Examiner(s) : Chai Yoon Yik

Chief Moderator : Steven Khoo Boo Tap

This paper consists of 6 printed pages, including the cover page

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)
 EEE1105: CIRCUIT THEORY & ELECTRONIC DEVICES
 FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

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Question 1 [25]

- (a) A two sources network is shown in Figure Q1(a). Using nodal analysis, calculate the node voltages V_1 , V_2 and V_3 . [9]

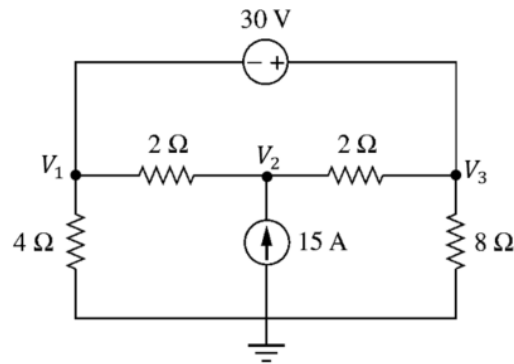


Figure Q1(a)

- (b) In the circuit of Figure Q1(b), use mesh analysis to calculate I_o and V_{ab} . [9]

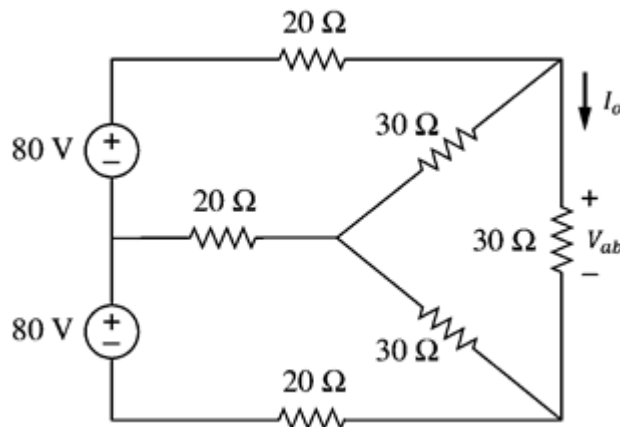


Figure Q1(b)

- (c) Find the Thevenin equivalent circuit external to the resistor R of the circuit as shown in Figure Q1(c). Subsequently, calculate the maximum power that can be delivered to R . [7]

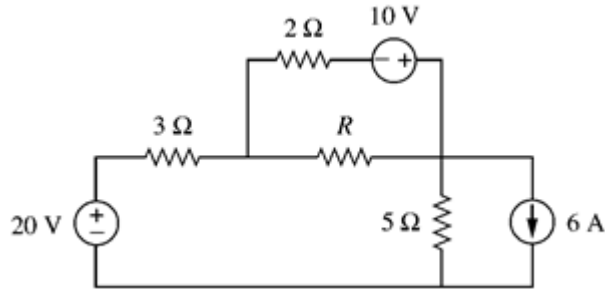


Figure Q1(c)

Question 2 [25]

- (a) Figure Q2(a) shows an electrical circuit connection with an alternating current source of $2\angle 30^\circ$ A.

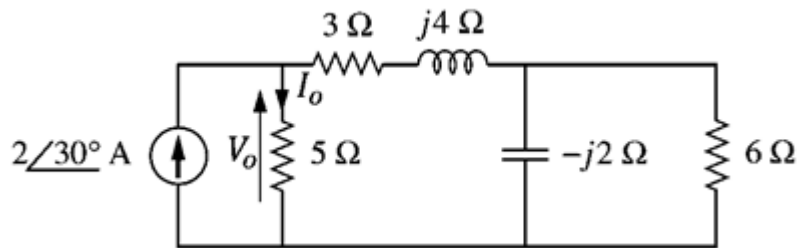


Figure Q2 (a)

Calculate:

- (i) The current phasor I_o and voltage phasor V_o . [4]
 - (ii) The complex power and power factor of the circuit. [2]
 - (iii) The average power delivered by the source. [2]
 - (iv) The reactive power of the circuit. [2]
- (b) A series R-L-C circuit is designed to resonate at $\omega_r = 10^5$ rad/s, have a bandwidth of $0.15\omega_r$, and draws 16 W from a 120 V alternating source at resonance.

Determine:

- (i) The bandwidth in hertz. [1]
 - (ii) The R, L, and C values. [6]
 - (iii) The quality factor of the circuit. [2]
 - (iv) The maximum voltage across the capacitor. [2]
- (c) Discuss the importance of Q factor in both series and parallel R-L-C circuit design. [4]

Question 3 [25]

(a) Figure Q3(a) shows an RC circuit with the switch opened at $t = 0$.

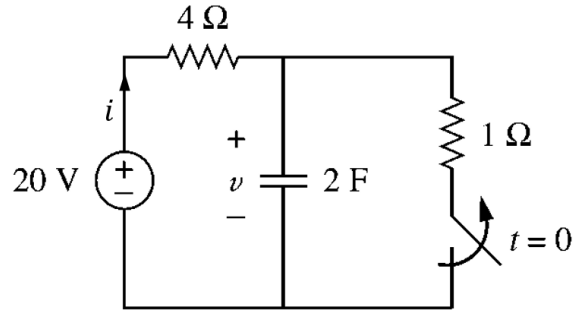


Figure Q3(a)

- (i) Determine the $v(t)$ and $i(t)$ at $t = 0$. [2]
 - (ii) Determine the $v(t)$ and $i(t)$ for $t > 0$. [7]
 - (iii) Sketch the $v(t)$ and $i(t)$ for (a)(i) and (a)(ii). [4]
 - (iv) Determine the energy stored in the capacitor at steady-state. [2]
- (b) Explain the method to produce n-type and p-type silicon. List the majority carriers for each type of the silicon. [4]
- (c) For the network of Figure Q3(c), determine the maximum of V_i that will maintain V_L at 8V and not exceeding the maximum power rating of the Zener diode. [6]

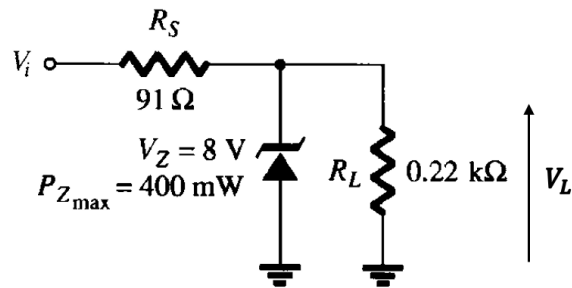


Figure Q3(c)

Question 4 [25]

(a) A bipolar junction transistor is connected in a circuit as shown in the Figure Q4(a).

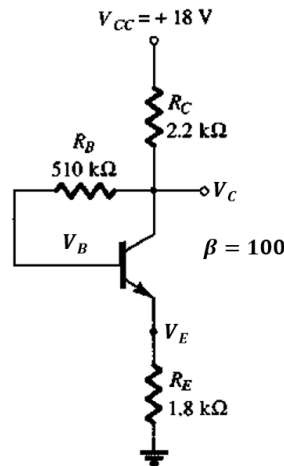


Figure Q4(a)

- (i) Name the transistor circuit configuration. [1]
 - (ii) Explain the situation of voltage V_c if the resistor R_B is open. [2]
 - (iii) Explain the situation of V_{CE} when β increases due to temperature. [2]
 - (iv) Explain the effect on V_E when the collector resistor is being replaced with a resistance at the lower end of the tolerance range? [2]
 - (v) Explain the situation of V_E when the transistor collector connection is opened. [2]
 - (vi) Explain the reason for V_{CE} becomes nearly 18 V? [2]
- (b) Sketch the three terminals symbol for 4 different types of MOSFET. [2]
- (c) Figure Q4(c) shows a MOSFET transfer characteristics and a bias line of a MOSFET circuit with feedback biasing arrangement base on $V_{DD} = 18V$ and $R_S = 0 \Omega$.

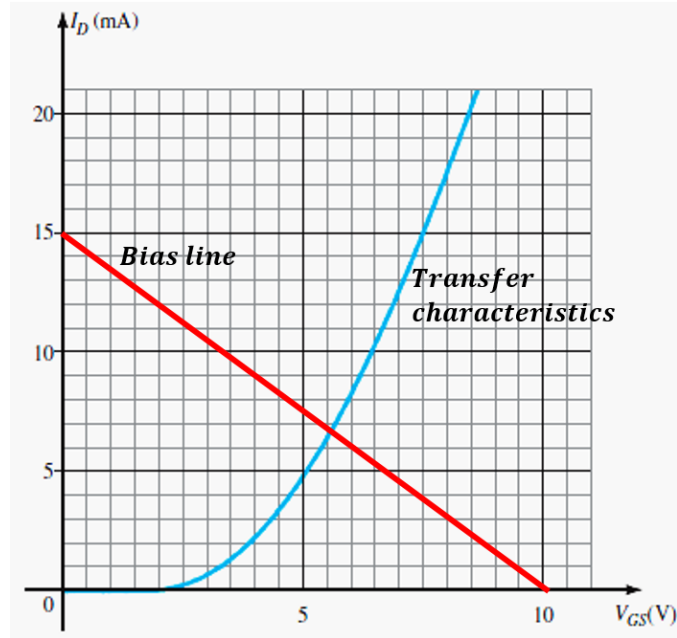


Figure Q4(c)

- (i) Identify the type of MOSFET base on Figure Q4(c). [2]
- (ii) Determine the MOSFET threshold voltage, V_T and Shockley's equation constant k . [4]
- (iii) Determine the V_{GSQ} and I_{DQ} . [2]
- (vi) Determine the R_D , V_D , V_{DS} and MOSFET power dissipation. [4]

~THE END~

EEE1105 (F) / April 2021 Session / formatted