FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**April 2022**
Programme	:	DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING (DEEI)
Course	:	EEE1105: Circuit Theory and Electronic Devices
Date of Examination	:	02 August 2022 (Tuesday)
Time	:	08.00am-11.00am Reading Time : Nil
Duration	:	03 hours

Special Instructions :

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

Material permitted :
Non-Programmable Scientific Calculator

Materials provided :
Nil

Examiner(s)	:	Khadijah Kamarulazizi
Chief Moderator	:	Dr Solahuddin

This paper consists of 9 printed pages, including the cover page

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DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)
EEE1105: CIRCUIT THEORY & ELECTRONIC DEVICES
FINAL ASSESSMENT: APRIL 2022 SESSION

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Answer all questions. All the questions carry equal marks.

Question 1 [25]

(a) Calculate the voltage, V_{R2} for the network shown in Figure Q1(a) using Superposition Theorem. [10]

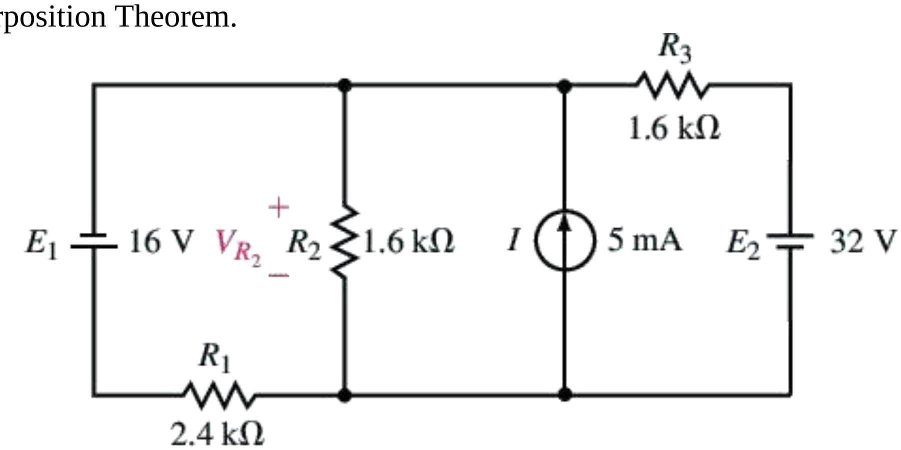


Figure Q1(a)

(b) Refer to the circuit in Figure Q1 (b). Convert the resistor of 15Ω, 12Ω and 10Ω using star to delta transformation (see Appendix for formula). Then calculate the voltage V across the resistor of 35Ω . [7]

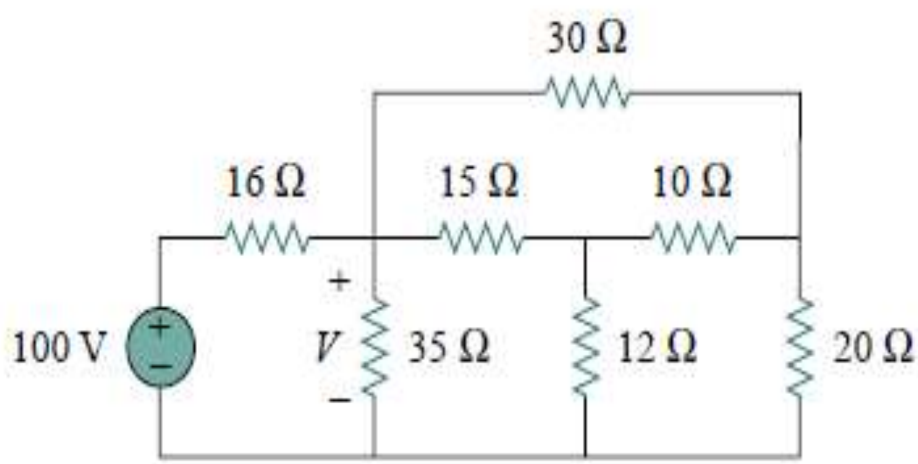


Figure Q1(b)

(c) Referring to the network in Figure Q1(c), determine the voltage drop across R_L using Thevenin's Theorem. [8]

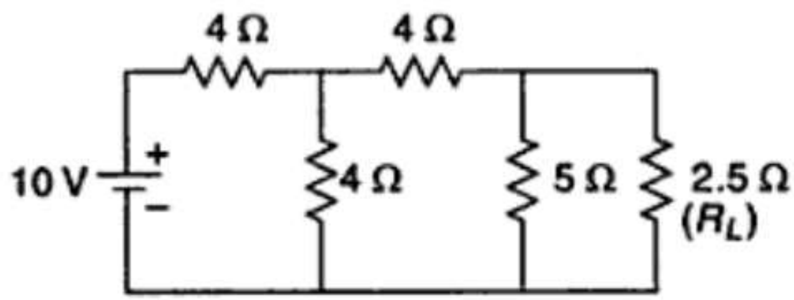


Figure Q1(c)

Question 2 [25]

(a) For the network of Figure Q2(a), calculate:

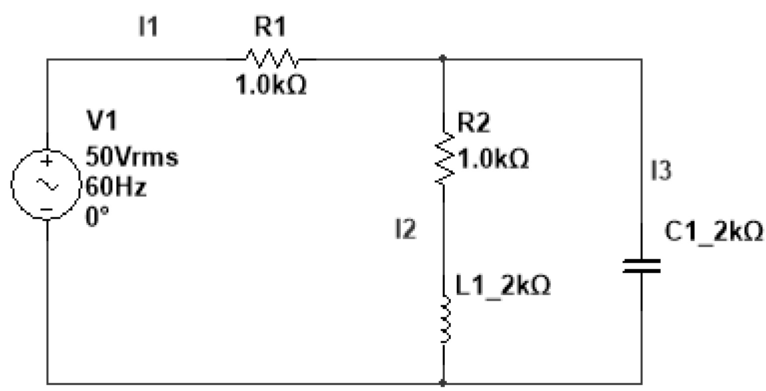


Figure Q2 (a)

(i) the total impedance, Z_T (including phase) of the circuit as seen from the power source. [5]

(ii) the current (including phase) of I_1, I_2 and I_3. [9]

(iii) the total active power provided by the voltage source. [2]

(b) For the system shown in Figure Q2(b), calculate:

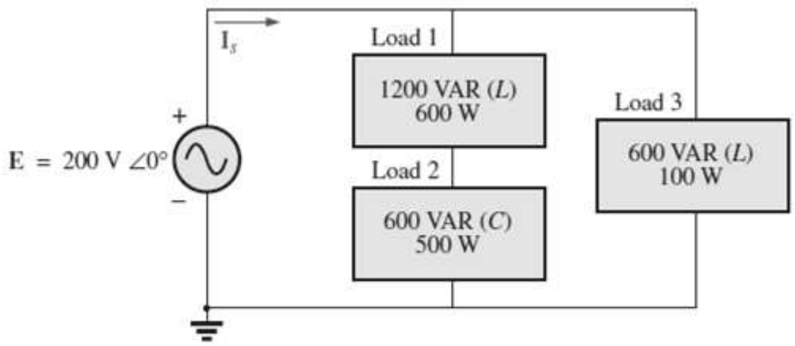


Figure Q2(b)

(i)	the total active power.	[1]
(ii)	the total reactive power.	[1]
(iii)	the resulting power factor of the system.	[4]
(iv)	the current I_s (including phase).	[3]

Question 3 [25]

(a) Figure Q3(a) shows an RC circuit with the 10μF capacitor fully charged. The switch is opened at $t = 0$s.

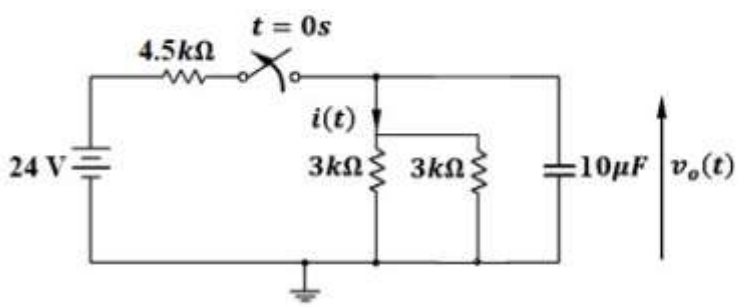


Figure Q3(a)

(i)	Calculate the time constant for t > 0 s.	[1]
(ii)	Calculate the v_o and i at $t = 0$ s.	[4]
(iii)	Write the $v_o(t)$ equation for $t > 0$.	[2]
(iv)	Write the $i(t)$ equation for $t > 0$.	[2]
(v)	Calculate the time taken for the capacitor voltage to decay to one-quarter of its initial value.	[2]
(vi)	Sketch the $v_o(t)$ and $i(t)$.	[2]

(b) For the network of Figure Q3(b), given V_i =15V_{dc}.

(i)	Find the value of V_L.	[2]
(ii)	Find the current flowing through the Zener diode.	[4]
(iii)	Find the power dissipated by the Zener diode.	[2]
(iv)	Give a reason whether the power rating of the Zener diode is suitable.	[2]
(v)	Find the total power dissipated by the whole circuit (include Zener diode).	[2]

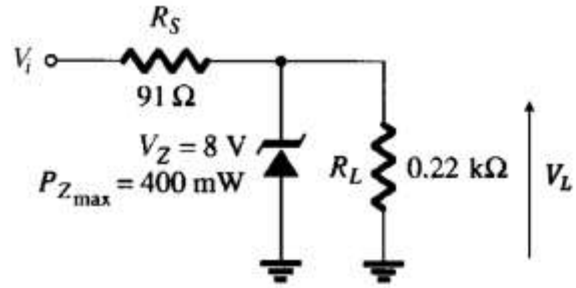


Figure Q3(b)

Question 4 [25]

(a) A BJT is connected as shown in the Figure Q4(a). C_1 and C_2 are ideal capacitor. Given the transistor current gain β = 100, Vcc= 20 V, R_C~~C~~= 1 kΩ, R_B= 193 kΩ and V_{BE} = 0.70 V when conducting.

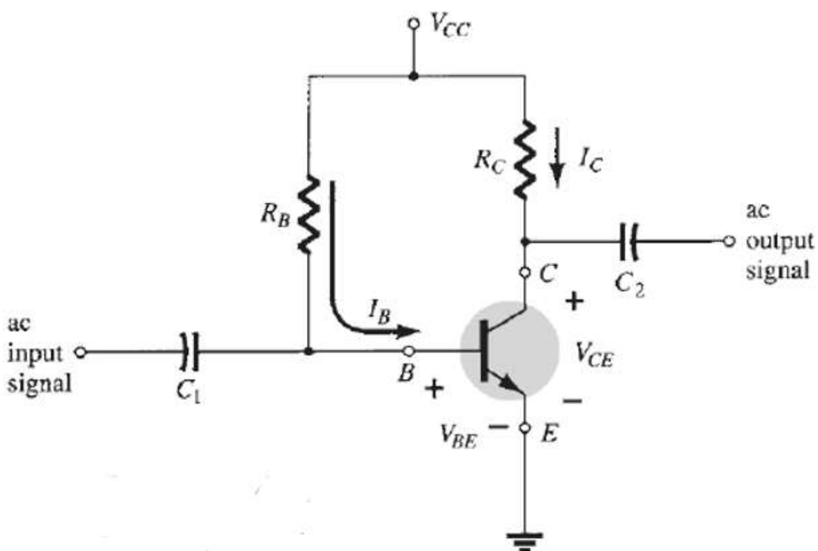


Figure Q4(a)

Calculate:

(i)	I_B	[2]
(ii)	I_C	[2]
(iii)	V_{CE}	[2]
(iv)	Power dissipated at the BJT.	[3]
(v)	Output voltage amplitude if given input is a sinusoidal current with peak to peak value Ip-p = 0.02 mA.	[4]

(b) Figure Q4b(i) shows an enhancement mode N-MOSFET circuit while Figure Q4b(ii) shows the R_{DS} vs T_j characteristic of the N-MOSFET used.
Given $R_{DS} = 0.50\Omega$ @ $T_j = 25°$ C.

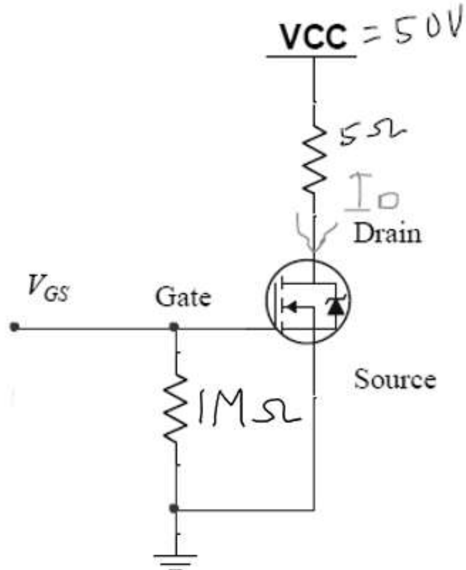


Figure Q4b(i)

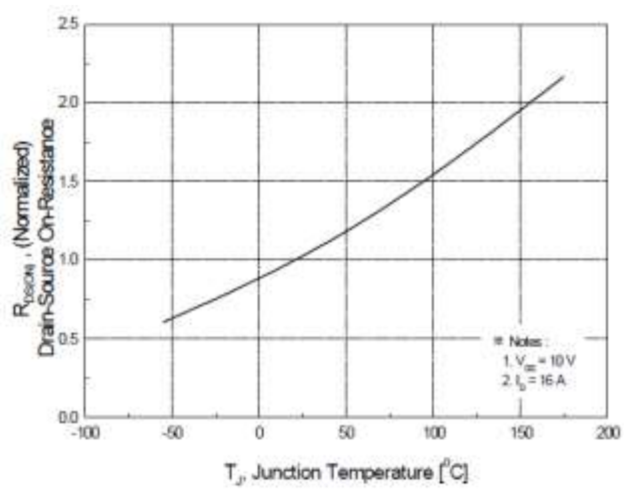


Figure Q4b(ii)

(i) Calculate the efficiency of this switch circuit if a fixed 10V is applied to V_{GS}, the 5 Ω is the load and the junction temperature $T_j = 25°C$. [4]

(ii) Calculate the efficiency of this switch circuit if a fixed 10V is applied to V_{GS}, the 5 Ω is the load and the junction temperature $T_j = 150°C$. [5]

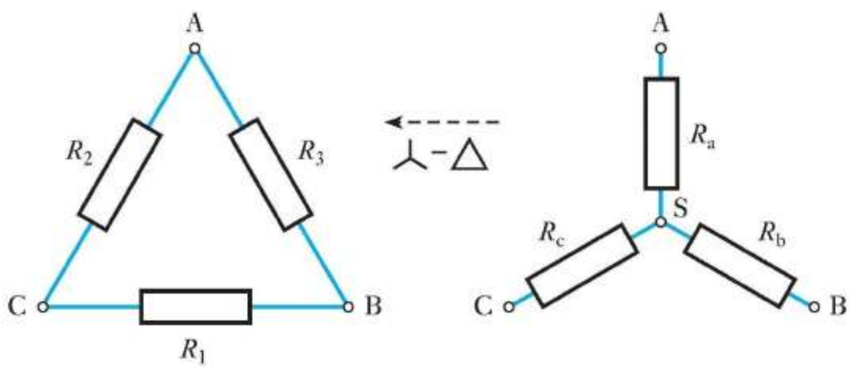
(iii) Explain the two functions of the 1MΩ at the gate. [2]

(iv) Calculate the efficiency of this switch circuit if a fixed 0V is applied to V_{GS}, the 5 Ω is the load and the junction temperature $T_j = 150°C$. [1]

~THE END~

APPENDIX

- Star-to-Delta transformation:



$$R_1 = R_b + R_c + \frac{R_b R_c}{R_a}$$

$$R_2 = R_c + R_a + \frac{R_c R_a}{R_b}$$

$$R_3 = R_a + R_b + \frac{R_a R_b}{R_c}$$