INTI International College Penang

FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**April 2020**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI)
Course	:	**EEE1105: Circuit Theory & Electronic Devices**
Date of Examination	:	3 August 2020 (Monday)
Time	:	2.00pm – 5.00pm Reading Time : Nil
Duration	:	3 Hours

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer all the questions in the answer booklet provided.
All questions carry equal marks.

Material permitted :
Non-Programmable Scientific Calculator

Materials provided :
Nil

Examiner(s)	:	**Mr Chai Yoon Yik**
Chief Moderator	:	Mr 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 2020 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer all the questions in the answer booklet provided. All questions carry equal marks.

Question 1 [25]

(a) A multiple sources network is as shown in Figure Q1(a).

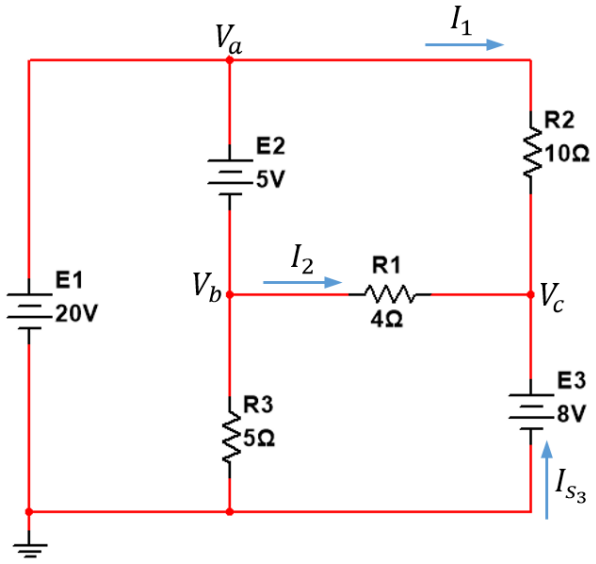

Figure Q1(a)

Using any circuit analysis theorems or principles that you have learned, calculate:

(i) V_a, V_b, V_c [3]
(ii) V_{ac} , V_{bc} [2]
(iii) I_1 , I_2 [2]
(iv) I_{s_3} [2]

(b) Calculate the currents I_1, I_2 and I_3 in the circuit as shown in Figure Q1 (b) using nodal analysis. [8]

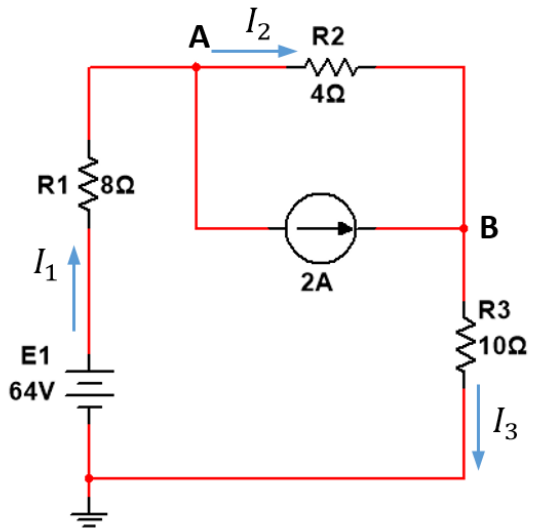

Figure Q1 (b)

(c) For the network shown in Figure Q1(c), calculate:

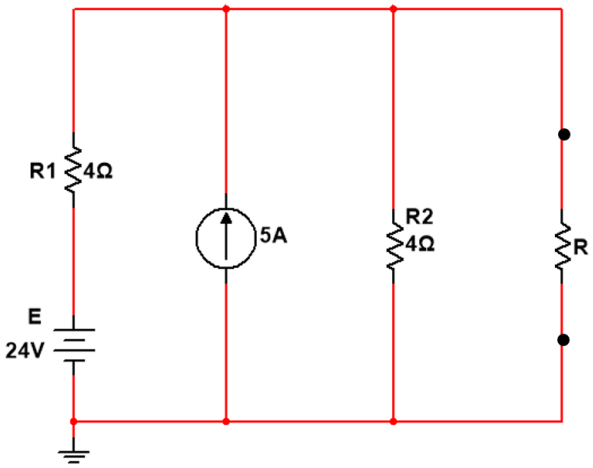

Figure Q1(c)

(i) The value of resistor R for maximum power delivered to the R. [2]

(ii) The maximum power delivered to the R. [6]

Question 2 [25]

A coil of resistance 50Ω and inductance 318 mH are connected in parallel with a circuit comprising a 75Ω resistor in series with a 159μF capacitor. The resulting circuit is connected to a 230V, 50Hz sinusoidal supply as shown in Figure Q2.

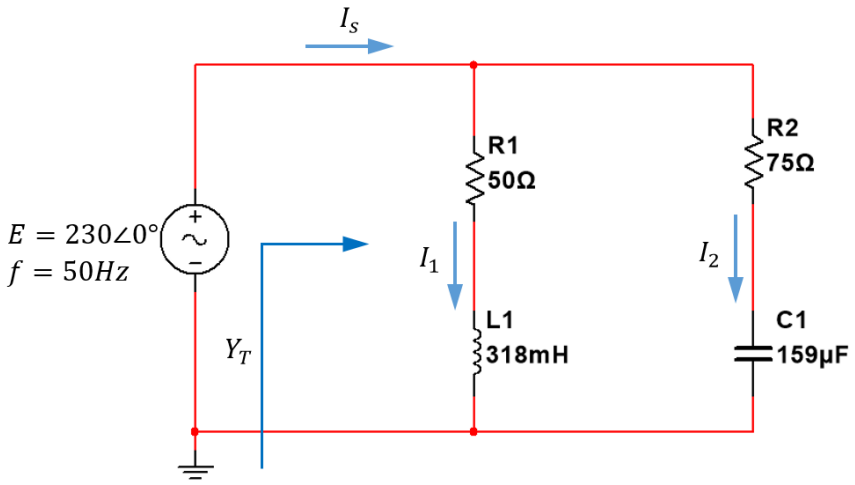

Figure Q2

(i) Calculate the total admittance, Y_T in polar form. [3]

(ii) Calculate the currents I_s, I_1 and I_2 in phasor form. [3]

(iii) Draw the phasor diagram of the currents I_s , I_1 , I_2 and voltage E. [4]

(iv) Calculate the real power, reactive power and apparent power delivered to the circuit. [3]

(v) Calculate the power factor of the circuit, and indicate whether it is leading or lagging. [2]

(vi) Justify a method to increase the power factor to unity without affecting the average power delivered to the circuit. [6]

(vii) Discuss the benefits of the higher power factor in an alternating current electrical circuit. [4]

Question 3 [25]

(a) For the network as shown in the Figure Q3(a), the capacitor has an initial voltage of 4V.

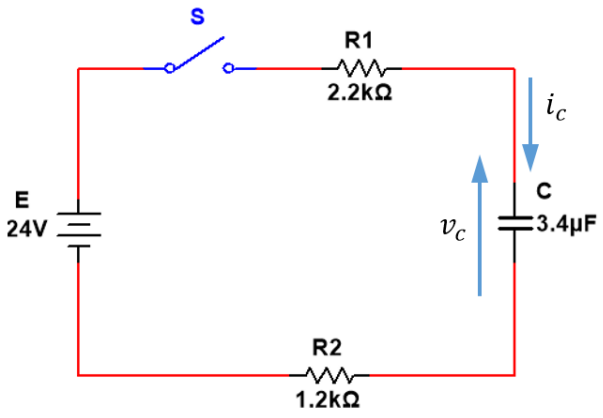

Figure Q3(a)

(i) Determine the mathematical expression for the voltage across the capacitor v_c once the switch **S** is closed. [4]

(ii) Determine the mathematical expression for the capacitor current i_c during the transient period. [4]

(iii) Sketch the waveforms for part (a)(i) and part (a)(ii) from the initial value to the final value. [4]

(b) Describe the differences between *n*-type and *p* -type semiconductor materials. [4]

(c) Figure Q3(c) shows a clipper circuit, sketch the output voltage waveform, v_{out} and label all the important values of the waveform in your sketch. Assume silicon diodes are used.

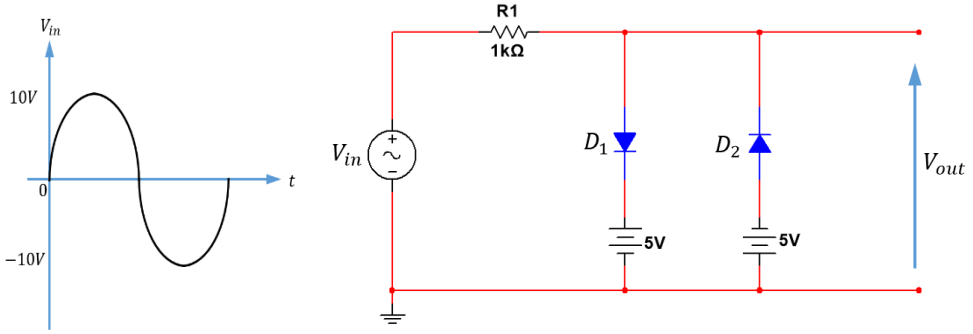

Figure Q3(c)

[9]

Question 4 [25]

(a) A bipolar junction transistor 2N2222A is connected in common emitter configuration as shown in the Figure Q4(a).

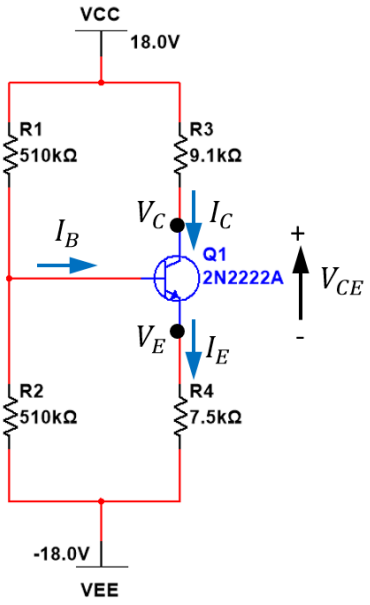

Figure Q4(a)

Calculate:

(i) I_B [5]

(ii) I_C [2]

(iii) V_E [2]

(iv) V_{CE} [2]

(b) Sketch an n-channel depletion-type MOSFET structure with proper labelling and explain the device operation. [4]

(c) For the MOSFET network shown in Figure Q4(c),

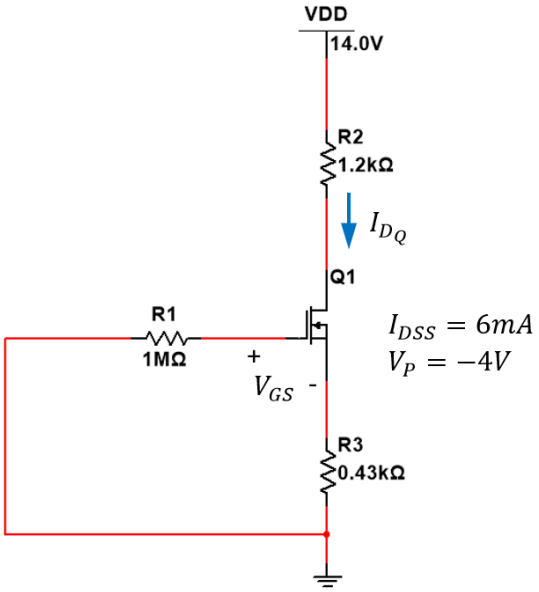

Figure Q4(c)

(i) Name the type of MOSFET. [1]

(ii) Name the type of MOSFET biasing. [1]

(iii) Draw the transfer characteristics and the bias line. [4]

(iv) Determine the V_{GS_Q} and the I_{D_Q} using the graph drawn in (iii). [2]

(v) Calculate the V_{DS_Q} and the V_{D_Q}. [2]

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