INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2018**
Programme	:	Diploma in Electrical and Electronic Engineering (DEEI)
Course	:	**EEE 1105: Circuit Theory & Electronic Devices**
Date of Examination	:	11 December 2018 (Tuesday)
Time	:	2:00pm – 4:00pm Reading Time : Nil
Duration	:	2 Hours
Special Instructions	:	

This paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

IMPORTANT NOTE : THIS PAPER SHOULD NOT BE TAKEN OUT OF THE EXAMINATION HALL

Materials permitted :

Non-Programmable Scientific Calculator

Materials provided :

Nil

Examiner(s)	:	**Dr. Lee Zhi Hou**
Moderator	:	Dr. Ooi Beng Lee

This paper consists of 11 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)
EEE1105: CIRCUIT THEORY & ELECTRONIC DEVICES
FINAL EXAMINATION: AUGUST 2018 SESSION

Instructions: This paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1 (25 marks)

(a) For the circuit shown in Figure 1(a), find the value of voltage V_{ab} using voltage divider rule

(5 marks)

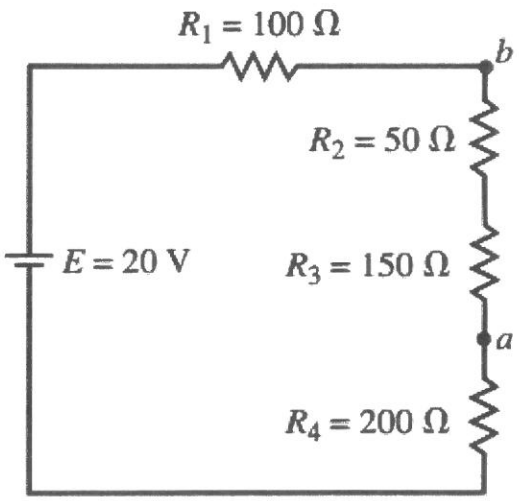

Figure 1(a)

(b) A circuit is arranged as shown in Figure 1(b). Determine :

(i) R_T (equivalent resistance "seen" by the voltage source).

(6 marks)

(ii) the current I_1.

(2 marks)

(iii) the current I_5.(the current that flows through resistor R_5).

(4 marks)

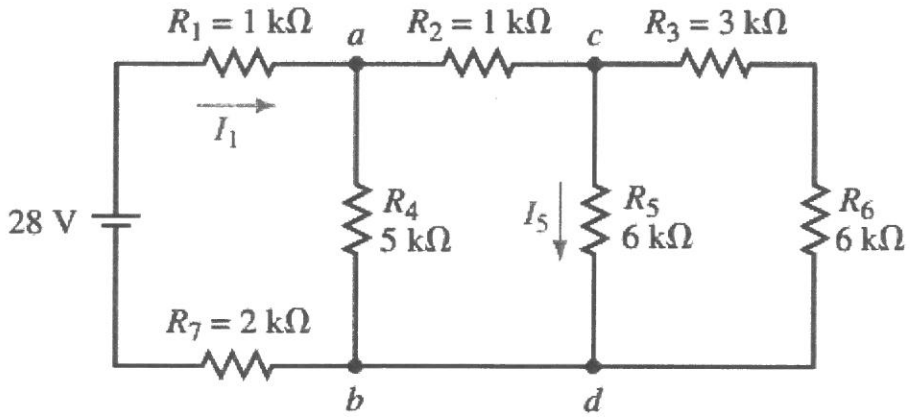

Figure 1(b)

(c) Using Superposition Theorem, calculate the voltage V_{ab} in Figure 1(c).

(8 marks)

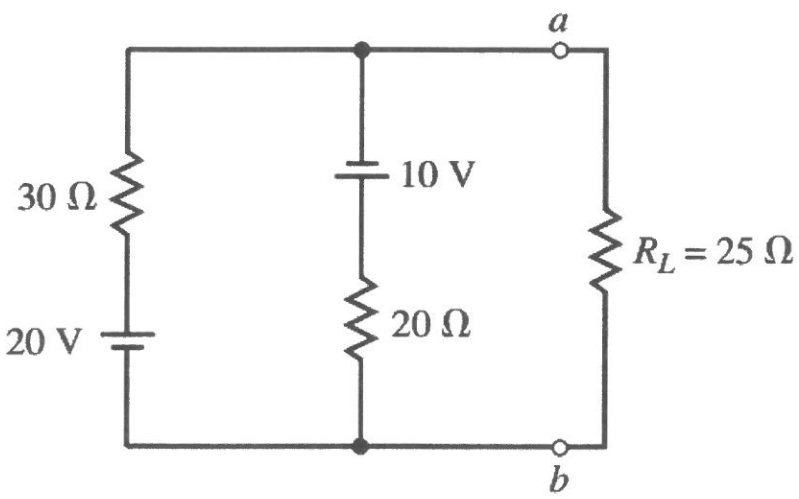

Figure 1(c)

Question 2 (25 marks)

(a) Refer to the circuit in Figure 2(a),

(i) find the Thevenin equivalent external to resistor R_L .

(8 marks)

(ii) use the Thevenin equivalent circuit to determine the value of the current I_L.

(4 marks)

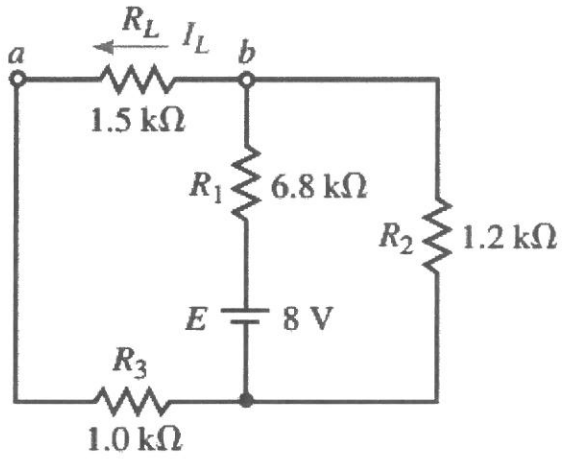

Figure 2(a)

(b) Write the nodal equations for the circuit in Figure 2(b) and then calculate the voltage V_{ab}

(13 marks)

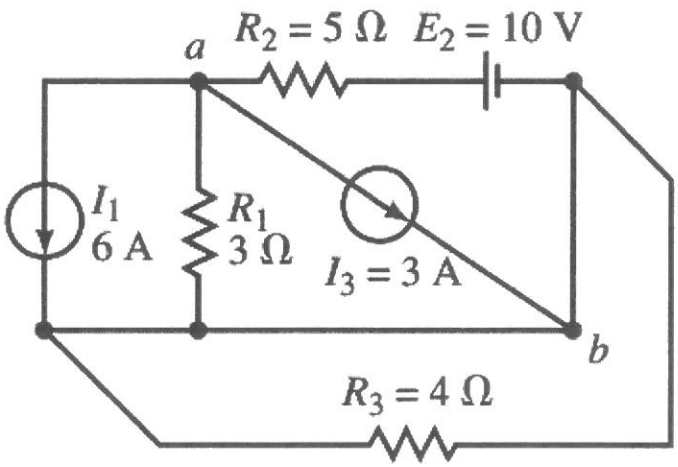

Figure 2(b)

Question 3 (25 marks)

(a) Refer to the circuit in Figure 3(a), given that the total capacitance C_T is 20μF, determine the value of capacitor C_x.

(4 marks)

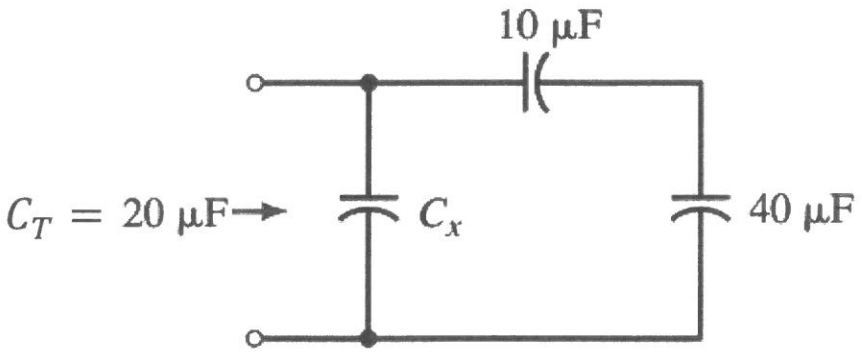

Figure 3(a)

(b) The circuit in Figure 3(b) shows the alternating currents (AC) circuit for certain application.

i) Determine the total impedance Z_T that is "seen" by the voltage source.

(8 marks)

ii) Calculate each of the currents I_1, I_2 and I_3.

(6 marks)

iii) Find the power factor and state the circuit is "lagging" or "leading".

(3 marks)

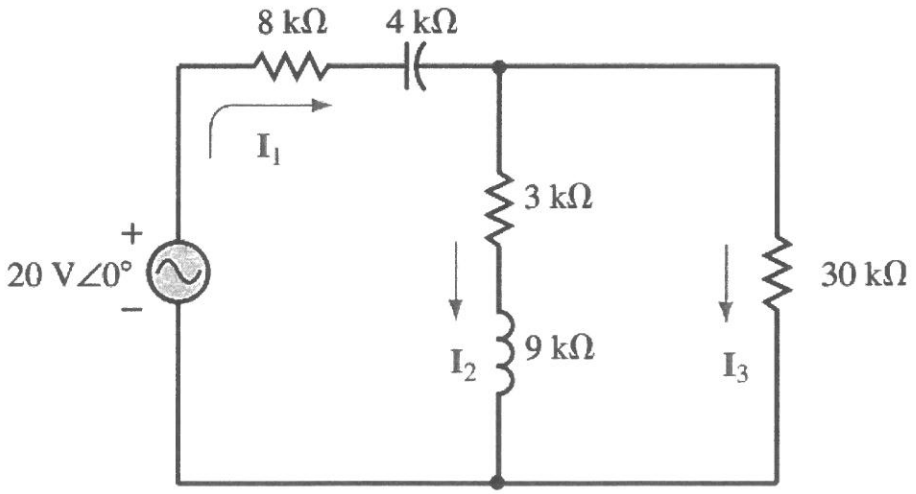

Figure 3(b)

(c) Figure 3(c) shows a series resonant circuit.

(i) Determine the resonant frequency of the circuit in **radians per seconds** and **Hertz** (Hz).

(4 marks)

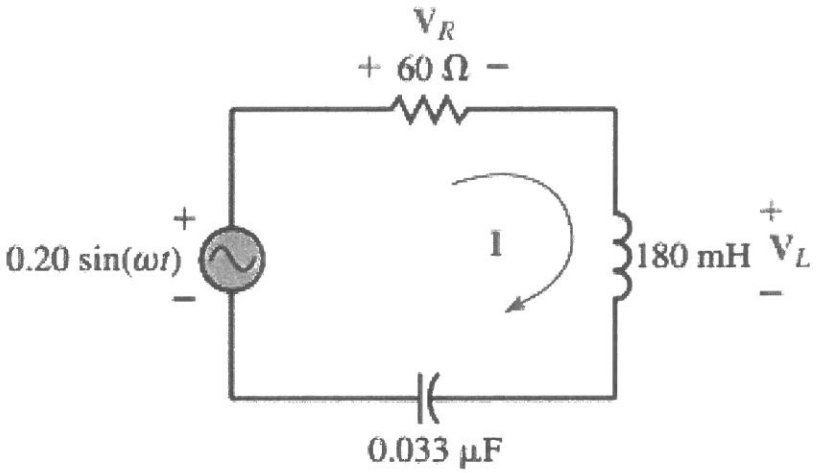

Figure 3(c)

Question 4 (25 marks)

(a) Figure 4(a) illustrates a silicon diode circuit, by assuming that the forward bias voltage of the silicon diode $V_D = 0.7\ V$, determine:

(i) $V_{10\Omega}$ (the voltage dropped across resistor 10 Ω)

(2 marks)

(ii) $V_{20\Omega}$ (the voltage dropped across resistor 20 Ω)

(2 marks)

(iii) the current I.

(4 marks)

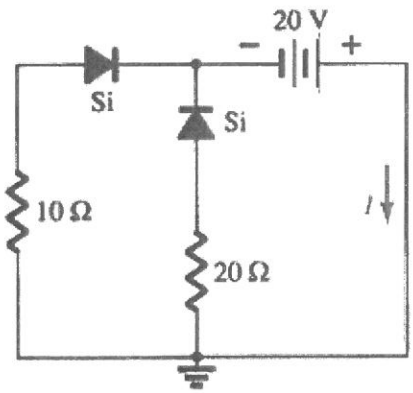

Figure 4(a)

(b) Figure 4(b) shows an ideal diode circuit. Sketch the output voltage v_o for the given input voltage v_i as shown. Assume that $5RC \gg \frac{T}{2}$.

(10 marks)

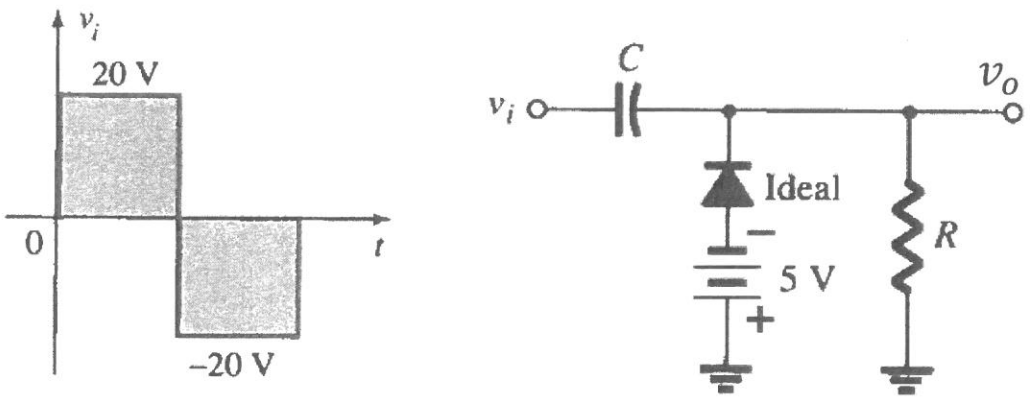

Figure 4(b)

(c) The circuit in Figure 4(c) illustrate the application of Zener diode. Given the Zener voltage V_z is 7 V and the Load Resistor R_L is 250 Ω,

(i) Find the voltage V_L and current I_L.

(4 marks)

(ii) Determine the current I_R.

(3 marks)

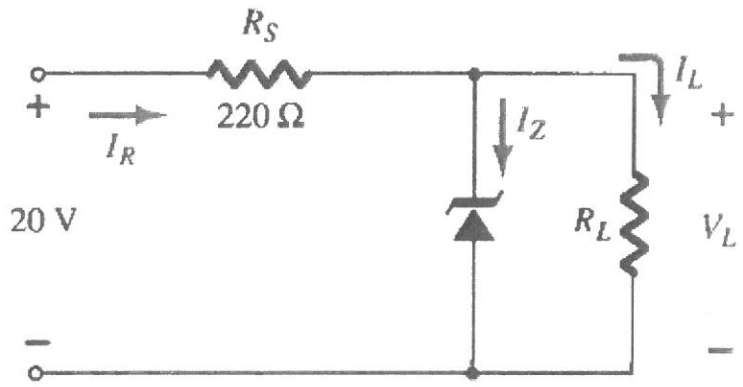

Figure 4(c)

Question 5 (25 marks)

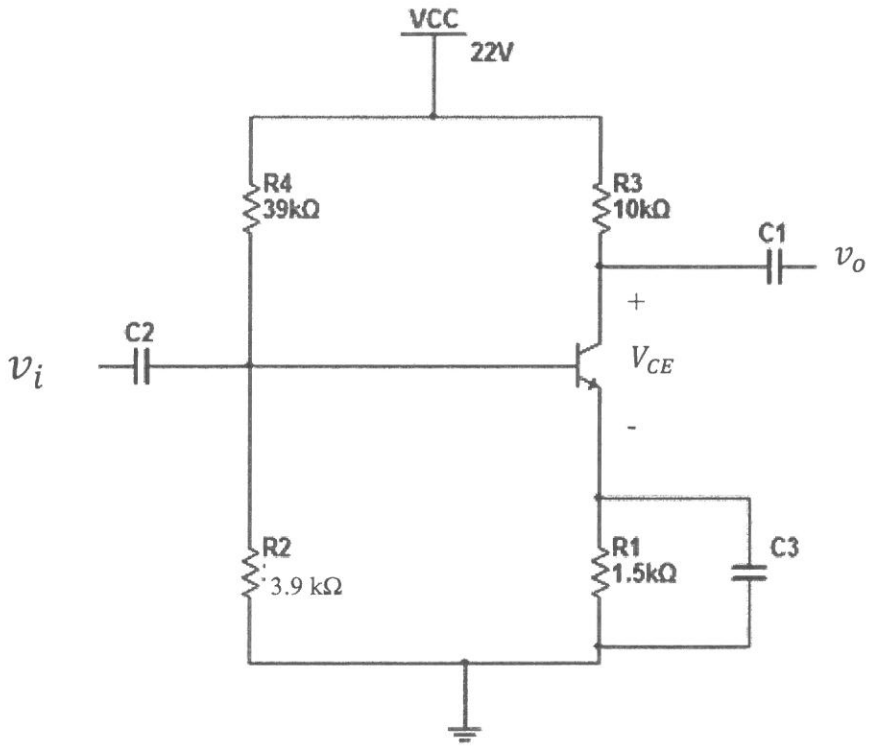

Figure 5(a)

(a) Figure 5(a) shows the circuit diagram of a NPN transistor with β=100 and output impedance r_0=50kΩ. v_i is the small signal input and v_o is the output. The capacitances of C1, C2 and C3 are assumed to be very large value.

(i) Determine the DC bias voltage V_{CE} , currents I_E, I_C and I_B using Exact Analysis.

(12 marks)

(ii) Draw the r_e equivalent model of the circuit.

(5 marks)

(iii) Determine the parameters of the system: input impedance Z_i , output impedance $Z_o$and gain A_v.

(8 marks)

Question 6 (25 marks)

(a) Refer to the circuit in Figure 6(a), the Bipolar Junction Transistor (BJT) is used as an inverter. Given that $I_{C_{sat}} = 10\,mA$ and $\beta = h_{FE} = 250$, determine the values of R_B and R_C with explanation.

(13 marks)

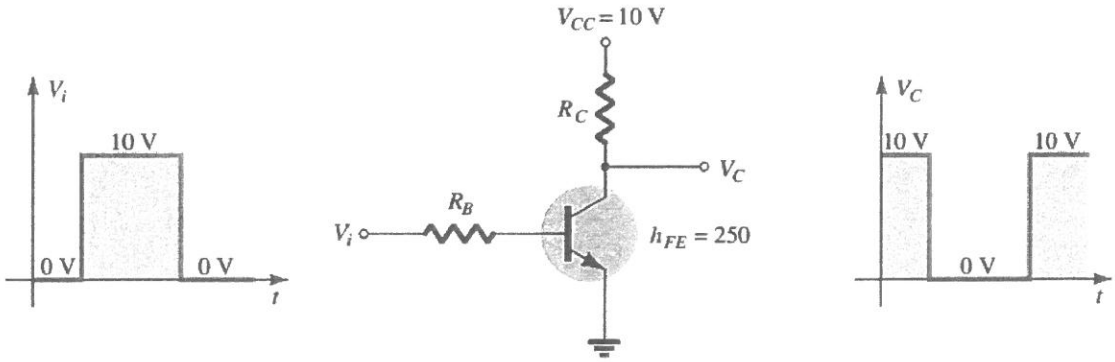

Figure 6(a)

(b) Figure 6(b) illustrates a fixed-biased configuration of field effect transistor (FET) circuit. Given that the Shockley's equation is $I_D = I_{DSS}(1 - \frac{V_{GS}}{V_P})^2$, using Mathematical Approach,

(i) find V_{GS_Q} and I_{D_Q}.

(4 marks)

(ii) calculate V_{DS} , V_D, V_G and V_s .

(8 marks)

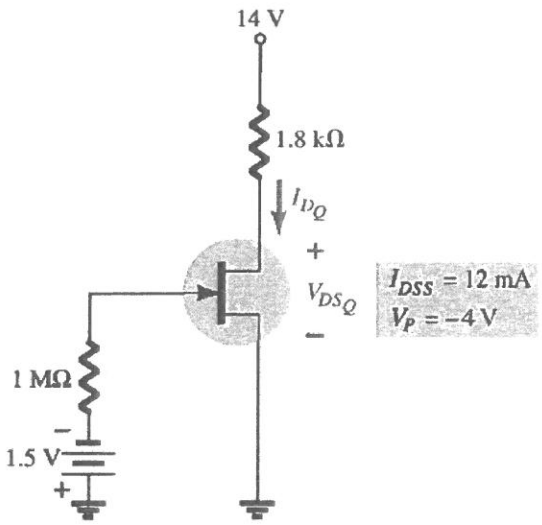

Figure 6(b)

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