

**INTI**  
**International College Penang**  
LAUREATE INTERNATIONAL UNIVERSITIES\*

**FINAL**  
Examination Paper  
(COVER PAGE)

Session : August 2015

Programme : Diploma in Electrical and Electronic Engineering (DEEI)

Course : EEE1105: Circuit Theory & Electronic Devices

Date of Examination : 8<sup>th</sup> December 2015 (Tuesday)

Time : 11:00am – 1:00pm

Duration : 2 Hours Reading Time : Nil

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) : Ms. Shalyn Lim Sheue Hui

Moderator : Mr. Kevin Tan

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

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)

EEE 1105: CIRCUIT THEORY & ELECTRONIC DEVICES  
 FINAL EXAMINATION: AUG 2015 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

- (a) State the Maximum Power Transfer Theorem. (2 marks)
- (b) With reference to Figure Q1(b). Calculate  $I$  using Superposition theorem. (6 marks)

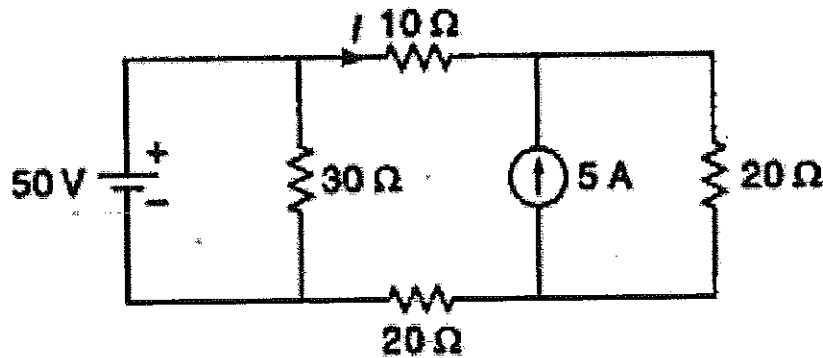


Figure Q1(b)

- (c) With reference to Figure Q1(c). Calculate node voltage 1 and 2 using Nodal Analysis. (6 marks)

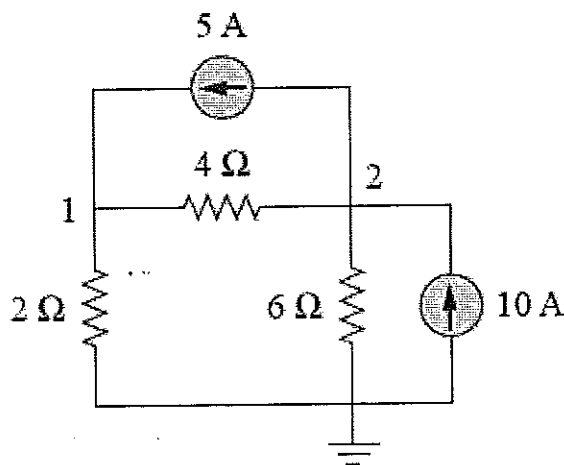


Figure Q1(c)

- (d) Calculate the current through  $15\ \Omega$  for the network shown in Figure Q1(d) using Thevenin's theorem.

(6 marks)

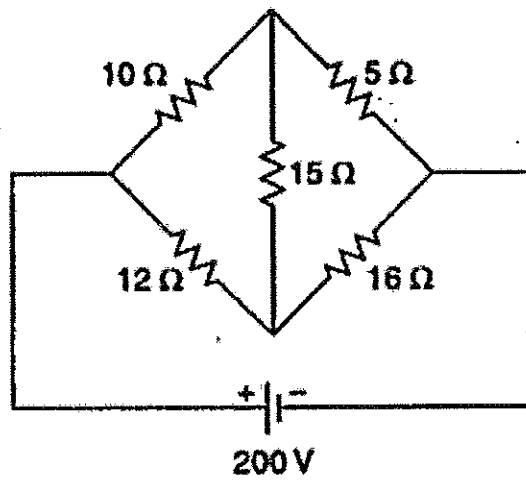


Figure Q1(d)

- (e) Determine the resistance between points A and B in the network shown in Figure Q1(e). (5 marks)

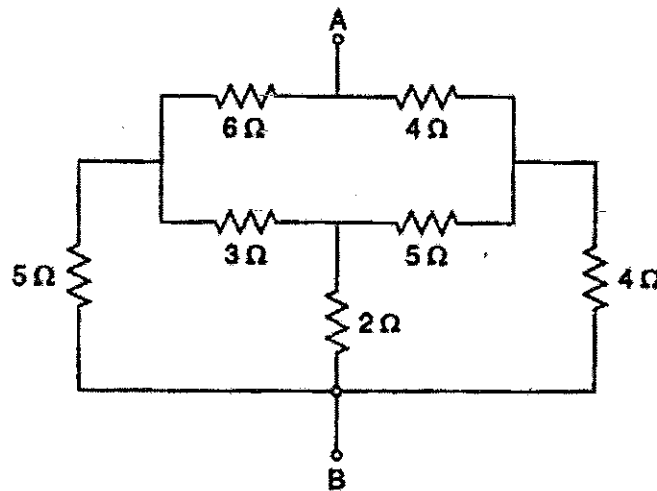


Figure Q1 (e)

Question 2

(a) The voltage  $v = 12 \sin(60t + 45^\circ)$  V is applied to a 0.1-H inductor. Find the steady-state current through the inductor in time domain. Sketch the phasor diagram. (4 marks)

(b) For the network of Figure Q2(b), calculate [\*answer in polar form]

(i) the total impedance  $Z_T$ . (4 marks)

(ii) the current  $I$ ,  $I_1$ ,  $I_2$  and  $I_3$ . (8 marks)

(iii) the power factor. (2 marks)

(iv) the total active power. (2 marks)

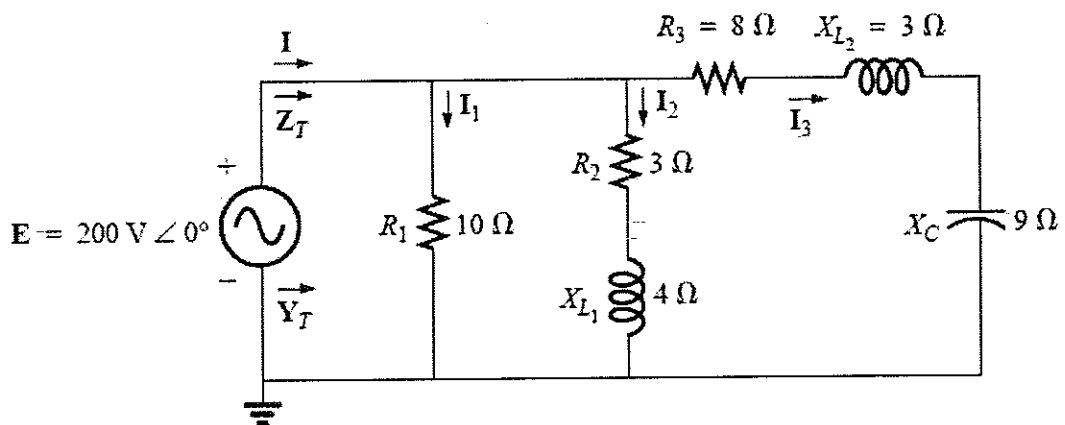


Figure Q2(b)

(c) A coil of negligible resistance and inductance 100mH is connected in series with a capacitance of 2 μF and a resistance of 10Ω across a 50V. Determine

(i) the resonant frequency. (2 marks)

(ii) the Q-factor of the circuit. (3 marks)

Question 3

- (a) Draw the load line of a diode and find the Q-point. You are required to label the load line axis based on theoretical derivation. (6 marks)
- (b) Figure Q3(b) shows the full wave rectifier circuit with the input sine wave of 60Hz.
- (i) Calculate the DC voltage at the output. (5 marks)
  - (ii) Calculate the ripple factor. (2 marks)
  - (iii) Determine the value of PIV. (2 marks)
  - (iv) Sketch the output voltage at  $R_L$ . (2 marks)

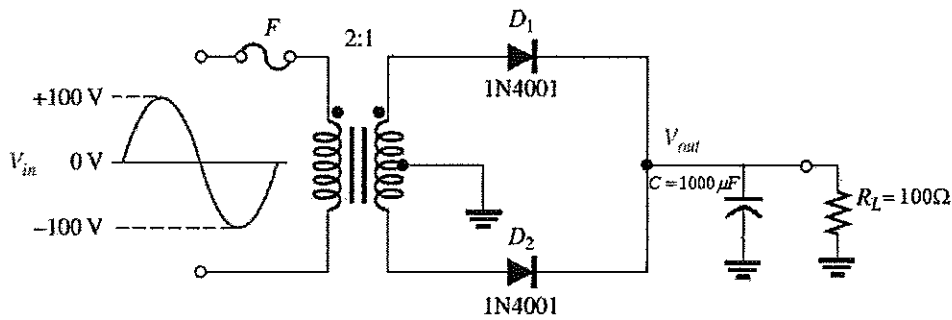
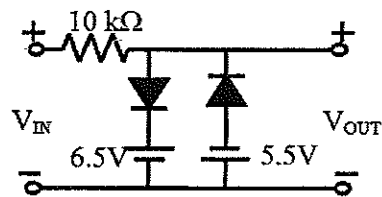
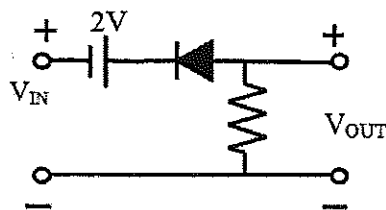


Figure Q3(b)

- (c) The input for the clippers shown in Figure Q3(c)(i) and (ii) is an oscillating sine wave with **peak value of 10V** and frequency of 100Hz. Sketch the output voltage waveform of the clippers circuit below. Assume the diodes are ideal. (7 marks)



(i)



(ii)

Figure Q3(c)

Question 4

(a) Sketch the BJT and label each terminal. (2 marks)

(b) For the emitter bias configuration network shown in Figure Q4(b), prove the equation for the base current,  $I_B$  as below :

$$I_B = \frac{V_{CC} - V_{BE}}{R_B + (\beta + 1)R_E}$$

(4 marks)

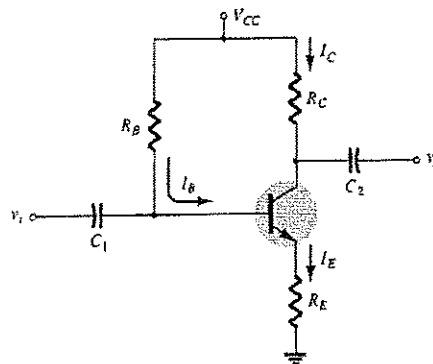


Figure 4(b)

(c) Given the fixed bias configuration network of Figure Q4(c) with the load line analysis. Calculate the value of  $V_{CC}$ ,  $R_C$  and  $R_B$ . (5 marks)

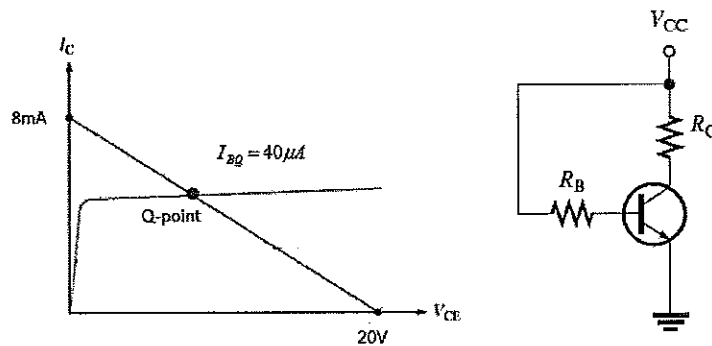


Figure Q4(c)

- (d) Figure Q4(d) shows the voltage-divider biased transistor circuit with  $\beta=100$ . Calculate  $I_B$  using
- (i) Approximate Method. (6 marks)
  - (ii) Exact Method. (6 marks)
  - (iii) % discrepancy between answer in part (i) and (ii). (2 marks)

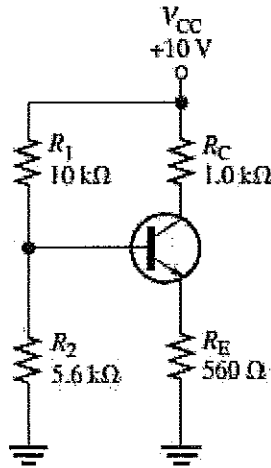


Figure Q4(d)

Question 5

(a) Sketch the E-MOSFET construction with the labeled terminals and discuss the operation. (5 marks)

(b) The problem of  $V_D$  significantly less than normal in Figure Q5 (b) was detected by a student during an experiment. Give three possibilities of the causes. (3 marks)

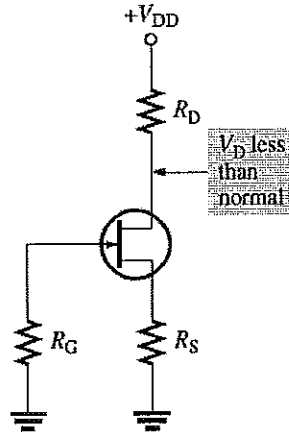


Figure Q5 (b)

(c) A JFET biasing network shown in Figure Q5(c).

(i) Determine  $I_{DQ}$  and  $V_{GSQ}$ . (6 marks)

(ii) Using the answer in part (i), sketch the transfer characteristic graph and indicate the Q-point. (4 marks)

(iii) Calculate  $V_{DS}$ . (2 marks)

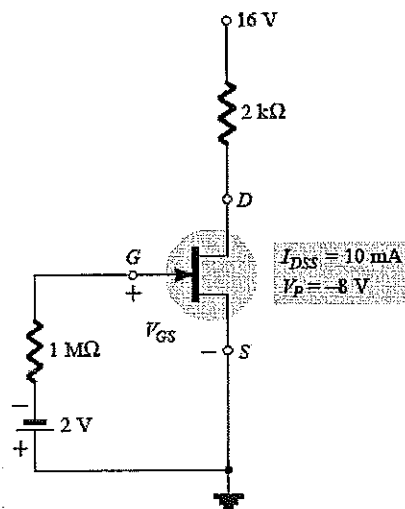


Figure Q5(c)

- (d) The levels of  $V_{DS}$  and  $I_D$  are specified as  $V_{DS} = \frac{1}{2} V_{DD}$  and  $I_D = I_{D(on)}$  for the network of Figure Q5(d). Determine the level of  $V_{DD}$  and  $R_D$ .

(5 marks)

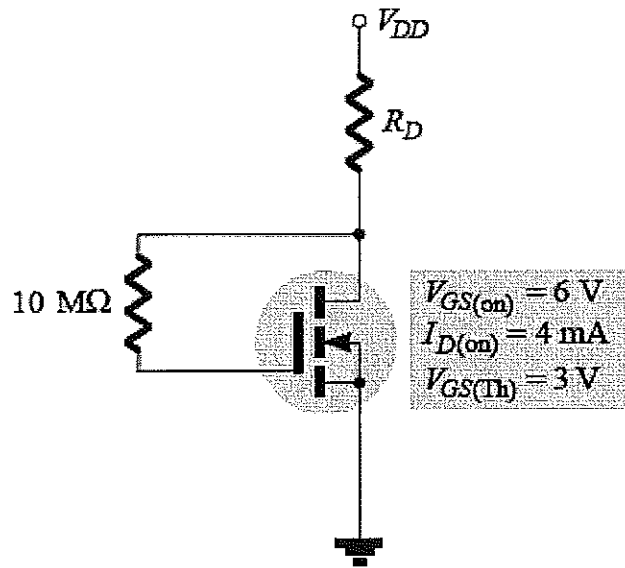


Figure Q5(d)

Question 6

(a) Refer to the circuit shown in Figure Q6 (a).

(i) State Norton's Theorem.

(2 marks)

(ii) Find the current through  $10\Omega$  resistor using Norton Theorem and sketch the equivalent circuit.

(8 marks)

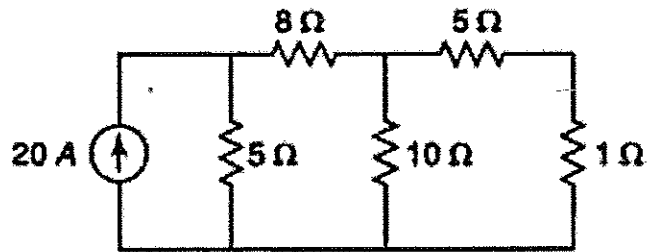


Figure Q6(a)

(b) Calculate  $I$  ( phasor domain) in the below AC network shown in Figure Q6 (b).  
Hint: Use Star-Delta transformation.

(7 marks)

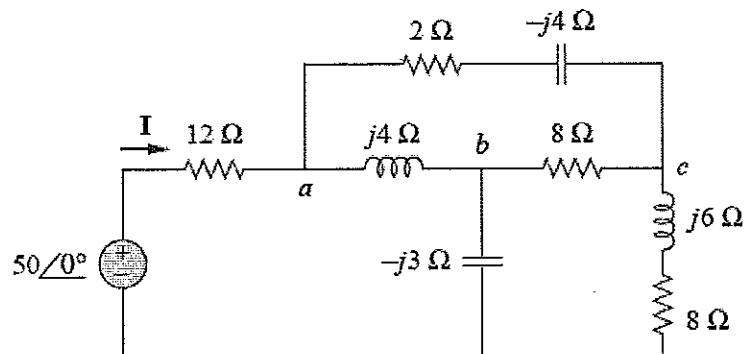


Figure Q6(b)

- (c) A student attempts to build a circuit that will turn a DC motor(Mtr) on and off with a push button switch as shown in Figure Q6(c). Unfortunately, there is something wrong with the circuit, because the motor does not turn on no matter what is done with the switch. Correct the error(s) in this circuit and explain why the circuit doesn't work, showing how it must be set up so that the transistor functions as intended.

(3 marks)

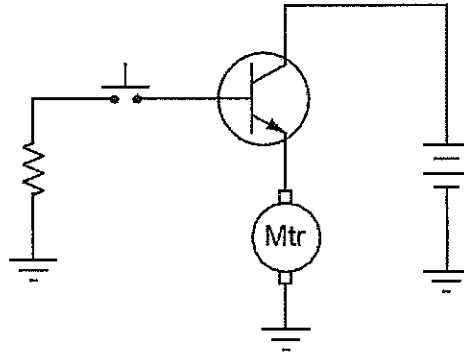


Figure Q6(c)

- (d) For Figure Q6(d), calculate  $V_{OUT}$  and current flow through the diode D1. Assume all the diodes are practical model.

(5 marks)

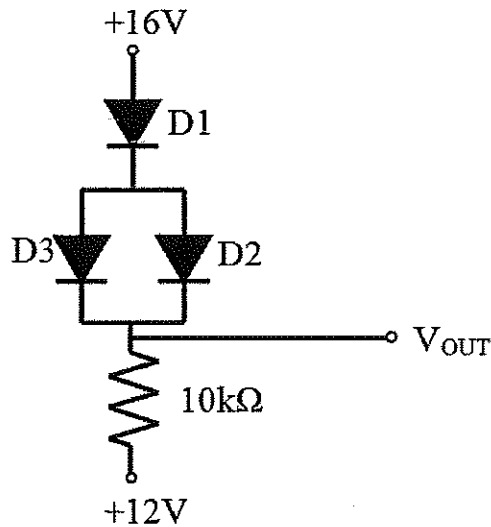


Figure Q6(d),

**-THE END-**

