INTI
INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	**AUGUST 2014**
Programme	:	DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING (DEEI)
Course	:	**EEE 1106: ANALOGUE ELECTRONICS**
Date of Examination	:	December 13, 2014 (Saturday)
Time	:	5.00pm – 7.00pm 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.

Materials permitted :

Non-Programmable Scientific Calculator

Materials provided :

Nil

Examiner(s)	:	**Ms. Shalyn Lim Sheue Hui**
Moderator	:	**Dr. Khoo Bee Ee**

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

INTI INTERNATIONAL COLLEGE PENANG
DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)

EEE1106: ANALOGUE ELECTRONICS
FINAL EXAMINATION: AUG 2014 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) For the RC network of Figure Q1(a) :

(i) Determine the transfer function.

(2 marks)

(ii) Calculate the attenuation (dB) at 100Hz.

(4 marks)

(iii) Sketch the asymptotes and locate -3dB point with corresponding cutoff frequency.

(2 marks)

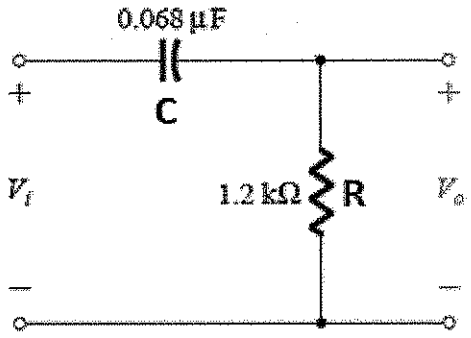


Figure Q1(a)

(b) Figure Q1 (b) shows a BJT based amplifier circuit. The transistor's β=120. Calculate

(i) the *re*.

(3 marks)

(ii) the mid band gain , A_{VSmid} = Vo/Vs.

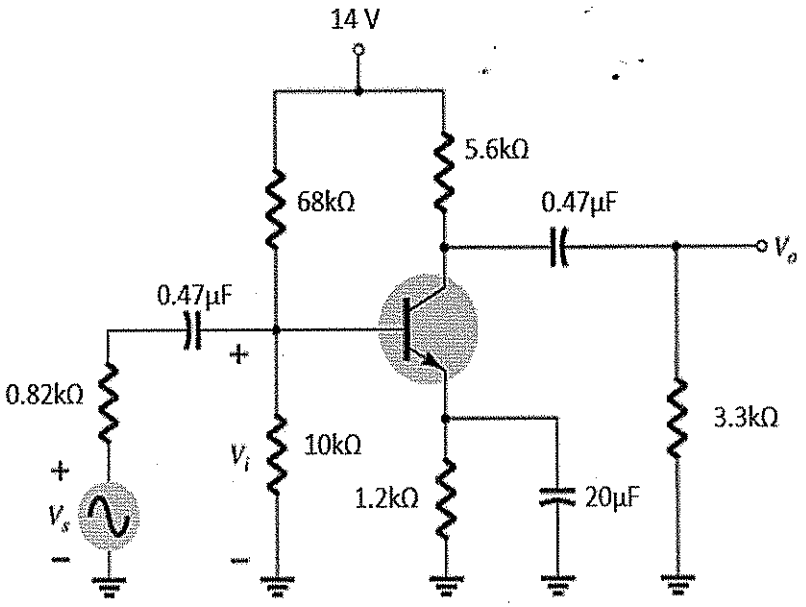
(3 marks)

(iii) the low cutoff frequencies based on coupling and bypass capacitor.

(6 marks)

(iv) the high cutoff frequencies based on coupling and bypass capacitor.

(5 marks)



C_{wi} = 5 pF
C_{wo} = 8 pF
C_{bc} = 12 pF
C_{be} = 40 pF
C_{ce} = 8 pF

Figure Q1(b)

Question 2

(a) Define crossover distortion. Describe the main cause of the distortion.

(3 marks)

(b) Draw the circuit diagram of a class B push-pull power amplifier using transformer coupled.

(3 marks)

(c) A transformer-couple class A amplifier drives a 16Ω speaker through a 3.87:1 transformer. Using a power supply of V_{cc} = 36V, the circuit delivers 2W to the load. Calculate

(i) the ac load voltage, V_L. (2 marks)

(ii) ac voltage across transformer primary.

(3 marks)

(iii) the rms value of load and primary current.

(4 marks)

(d) Refer to the power amplifier of Figure Q2(d).

(i) Calculate the efficiency, η%.

(5 marks)

(ii) Power dissipated by both transistors.

(2 marks)

(iii) If the input voltage to the power amplifier is 8V rms, calculate the input dc power.

(2 marks)

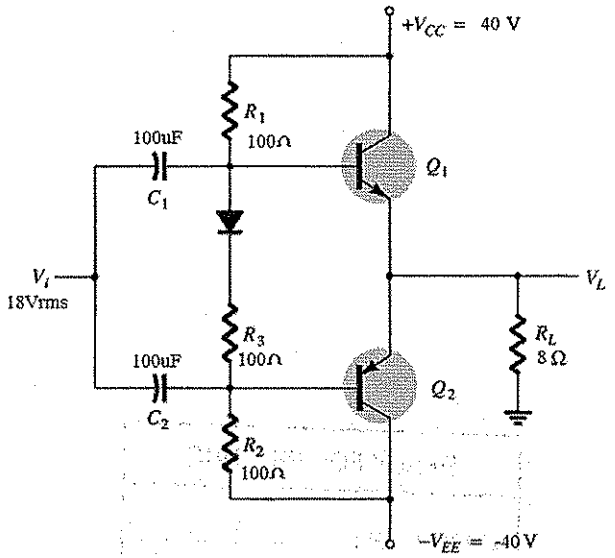


Figure Q2(d)

Question 3

(a) For the common gate configuration in Figure Q3 (a).

(i) Determine the Q-point (V_{GSQ} , I_{DQ})

(7 marks)

(ii) Calculate transconductance , g_m .

(3 marks)

(iii) Sketch the ac small signal equivalent circuit.

(3 marks)

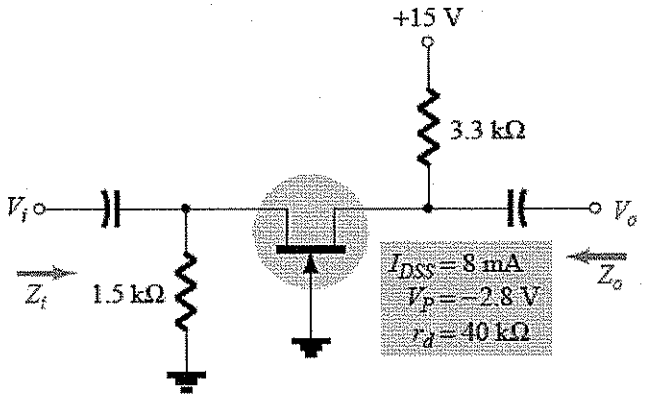


Figure Q3(a)

(b) Choose the values of R_D and R_S for the network of Figure Q3(b) that will result in a gain of 8 and the value of $V_{GSQ} = \frac{1}{4}V_p$. Next, calculate the input impedance Z_i and output impedance Z_o.

(12 marks)

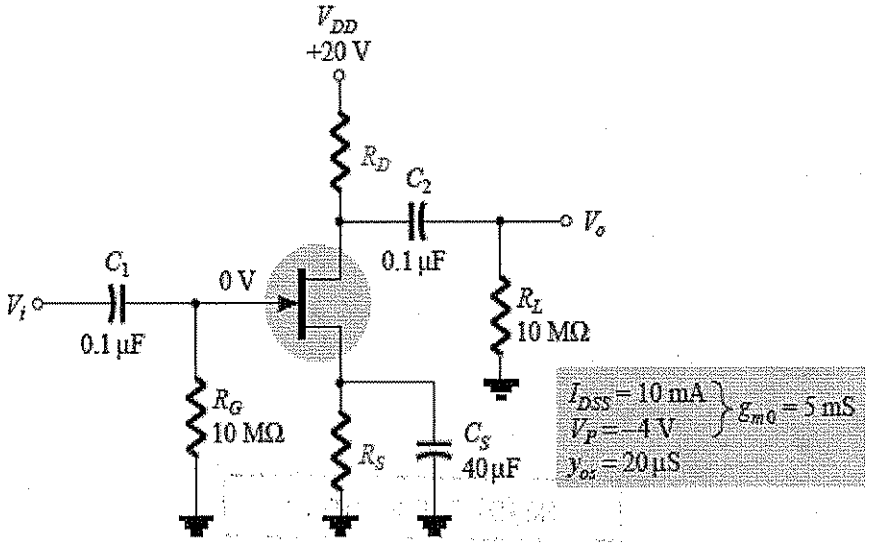


Figure Q3(b)

Question 4

(a) Draw the circuit diagram of integrator and differentiator op-amp. Derive the time domain expression for both networks.

(6 marks)

(b) Calculate V_o and i_o in the op-amp circuit shown in Figure Q4(b).

(5 marks)

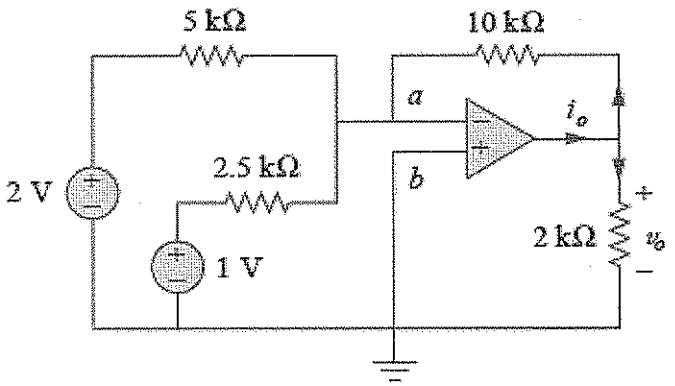


Figure Q4(b)

(c) Refer to Figure Q4(c), derive the transfer function for v_o/v_i.

(7 marks)

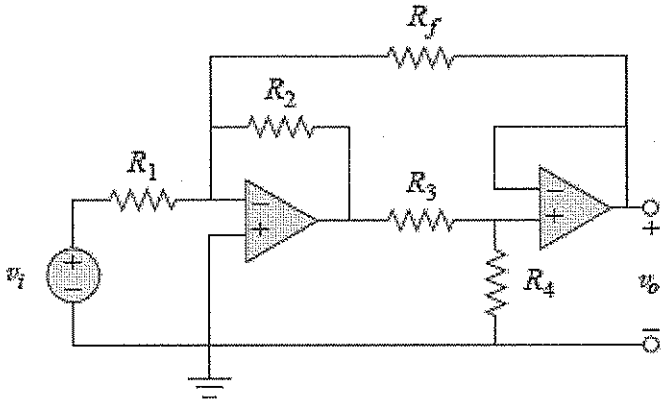


Figure Q4(c)

(d) Design a circuit to amplify the difference between two inputs by 2 by

(i) using one op-amp.

(2 marks)

(ii) using two op-amps.

(5 marks)

Question 5

(a) In the circuit of Figure Q5 (a), R = 8 kΩ, L=0.2 mH and C= 8 μF. Determine

(i) Find the resonant angular frequency and the half-power angular frequencies.

(7 marks)

(ii) the power dissipated at the frequencies in part (i)

(4 marks)

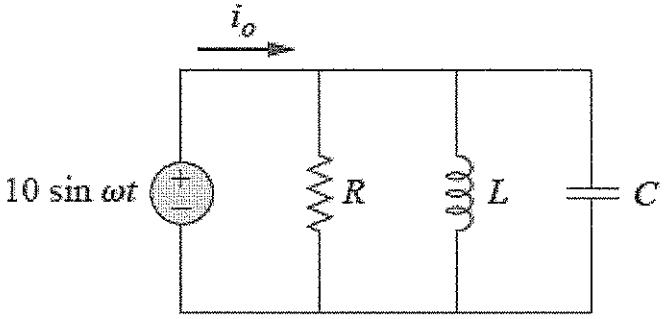


Figure Q5(a)

(b) Refer to the passive filter in Figure Q5 (b).

(i) Derive the transfer function.

(5 marks)

(ii) Calculate the critical frequency.

(3 marks)

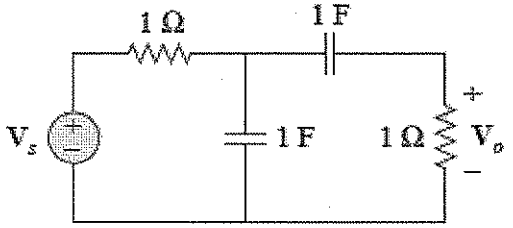


Figure Q5(b)

(c) Design and sketch an active bandpass filter to pass frequencies between 250 Hz and 3000 Hz to produce a DC gain with 10. Consider R=20kΩ for the design of bandpass frequencies.

(7 marks)

Question 6

(a) State the difference between a feedback oscillator and a relaxation oscillator.

(4 marks)

(b) With the sketch of circuit, explain the function of Twin-T oscillator.

(6 marks)

(c) Refer to the Wien-bridge oscillator in Figure Q6(c).

(i) What is purpose of using a JFET in the negative feedback. Explain the required condition to achieve the purpose.

(3 marks)

(ii) Calculate the setting for R_f assuming the internal drain-source resistance, r_{ds}, of the JFET is 350 Ω when oscillations are stable.

(3 marks)

(iii) Calculate the frequency of oscillation.

(2 marks)

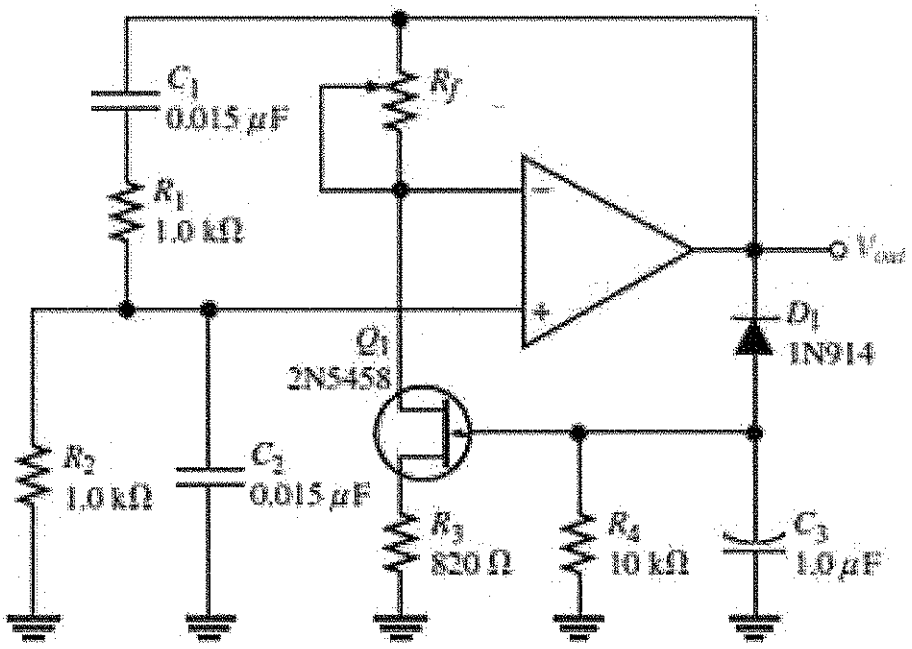


Figure Q6(c)

(d) Refer to the oscillator circuit in Figure Q6 (d).

(i) Find the amplitude and frequency of the saw tooth output in Assume that the forward PUT voltage, is approximately 1 V.

(5 marks)

(ii) Sketch the output waveform with proper labeling.

(2 marks)

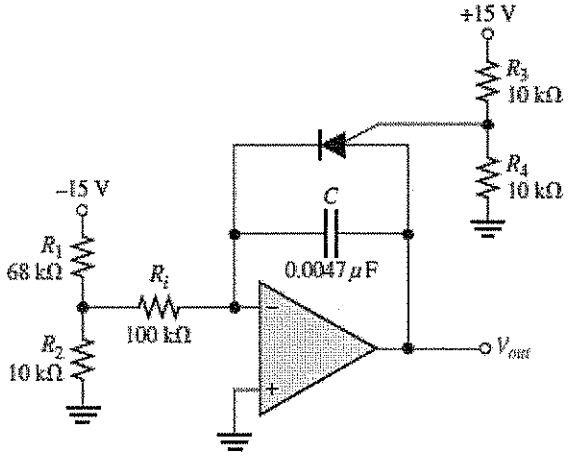


Figure Q6(d)

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