UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	ELECTRONIC CIRCUITS ANALYSIS AND DESIGN
COURSE CODE	:	BEL 30403
PROGRAMME	:	BED / BEU
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN** (7) PAGES

Q1 (a) State the advantages of operational amplifier with feedback network.

(4 marks)

(b) Based on input signal V_i in **Figure Q1 (b)(i)**, analyze and sketch the waveforms of V_{O1}, V_{O2} and V_{O3}, in **Figure Q1 (b)(ii)**. Assuming the initial voltage across the capacitor is zero.

(16 marks)

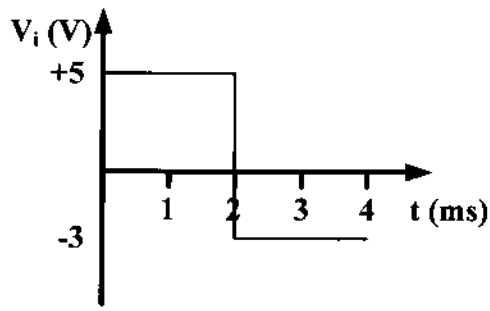

FIGURE Q1 (b)(i)

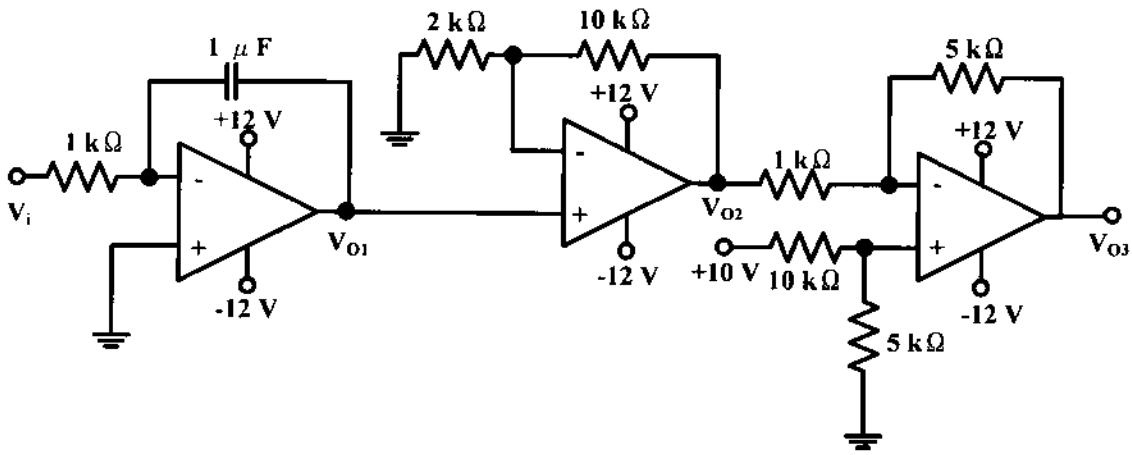

FIGURE Q1 (b)(ii)

Q2 (a) Explain the pass-band, transition-band and stop-band in frequency response of filter with the aid of diagram.

(4 marks)

(b) **Figure Q2 (b)** shows a third-order high-pass filter circuit. For this circuit,

(i) Calculate the cut-off frequency of this filter.

(2 marks)

(ii) Determine the roll-off rate and gain (in dB) of this filter.

(6 marks)

(iii) Sketch and label completely the frequency response of this filter.

(3 marks)

(iv) Propose the alternative design of filter in **Figure Q2 (b)** using Sallen-Key high-pass filter. Justify the advantages of the design.

(5 marks)

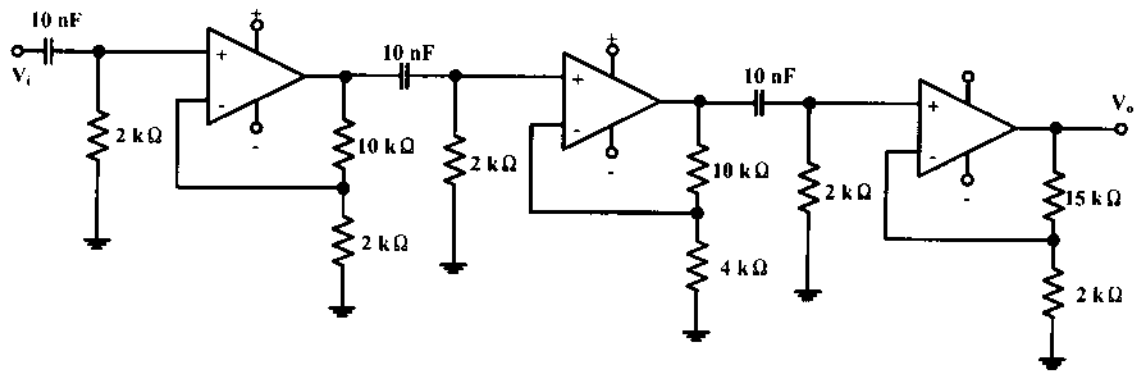

FIGURE Q2 (b)

Q3 (a) Systems without feedback have a gain of 75 dB, low cut-off frequency of 20 kHz and high cut-off frequency of 75 kHz. A negative feedback network with feedback factor β =0.0025 is connecting to the system to increase the bandwidth of frequency. Analyze and sketch the frequency response of the system with feedback network.

(8 marks)

(b) **Figure Q3 (a)** shows a voltage controlled oscillator (VCO) using 555 timers. Illustrate the output waveform, V_O at pin 3 and the capacitor voltage, V_{C1} at pin 2, if the potentiometer R_5 is connected at point A. Show all calculation. Assume the diode, D_1 is ideal.

(12 marks)

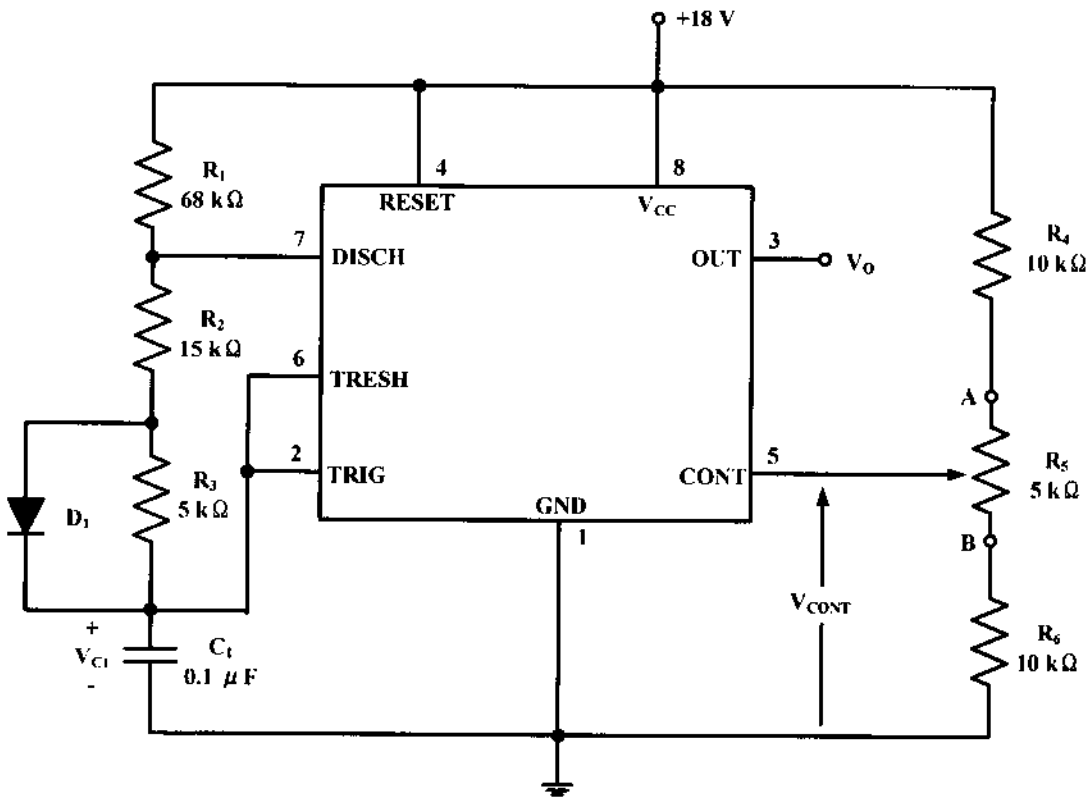

FIGURE Q3 (a)

Q4 (a) An oscillator circuit in **Figure Q4 (a)** will maintain its oscillation when $A\beta = 1$.

(i) Briefly explain how the circuit can be acts as an oscillator. State the name of the oscillator.

(4 marks)

(ii) Calculate R_2 if the oscillation frequency of the circuit, f_o = 13kHz.

(4 marks)

(iii) Derive the relationship between R_a and R_b so that this circuit will sustain its oscillation.

(2 marks)

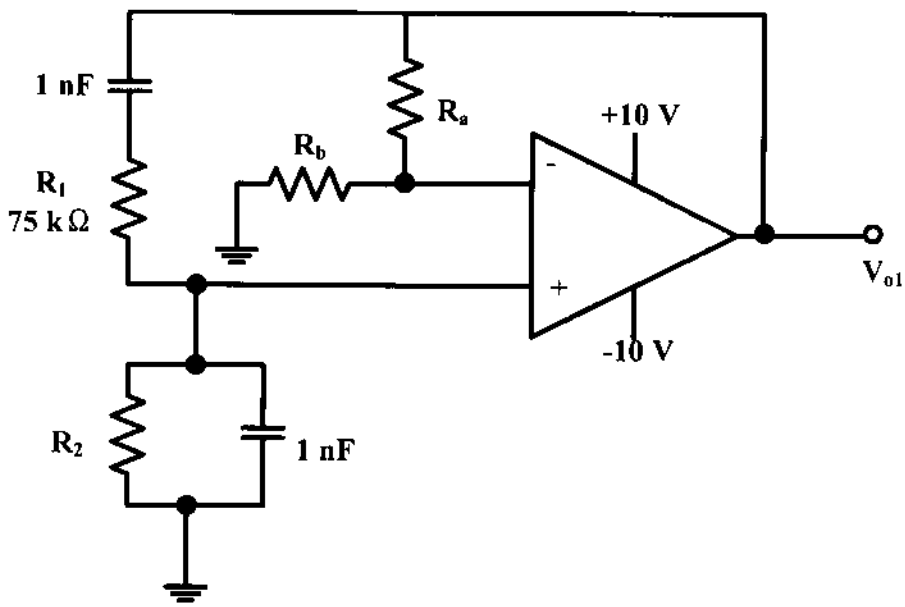

FIGURE Q4 (a)

(b) The output V_{o1} in **Figure Q4 (a)** is now connected to the input V_i in **Figure Q4 (b)**. Analyze the output V_{o2}. Show all calculation. Assuming breakdown voltage of Z_1 and Z_2 are 4.7 V.

(10 marks)

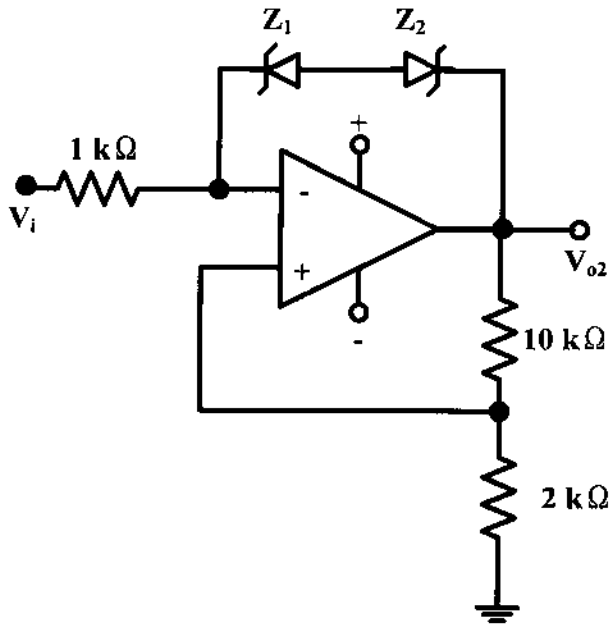

FIGURE Q4 (b)

Q5 **Figure Q5** shows the circuit diagram for a simple DC power supply.

(a) Analyze the output waveform if a load current, I_L is 0.2A and voltage across R_L, V_L is 12V. Assuming a ripple factor across the load is 15%. Show all calculation.

(9 marks)

(b) Calculate the number of primary winding, N_P and smoothing capacitance C if AC source is 110 V_{rms} operating at 50 Hz.

(6 marks)

(c) An additional RC filter is connected to the circuit in **Figure Q5** to reduce the ripple voltage. Analyze the new ripple factor (%) if the value R and C are 50 Ω and 1000 μF, respectively.

(5 marks)

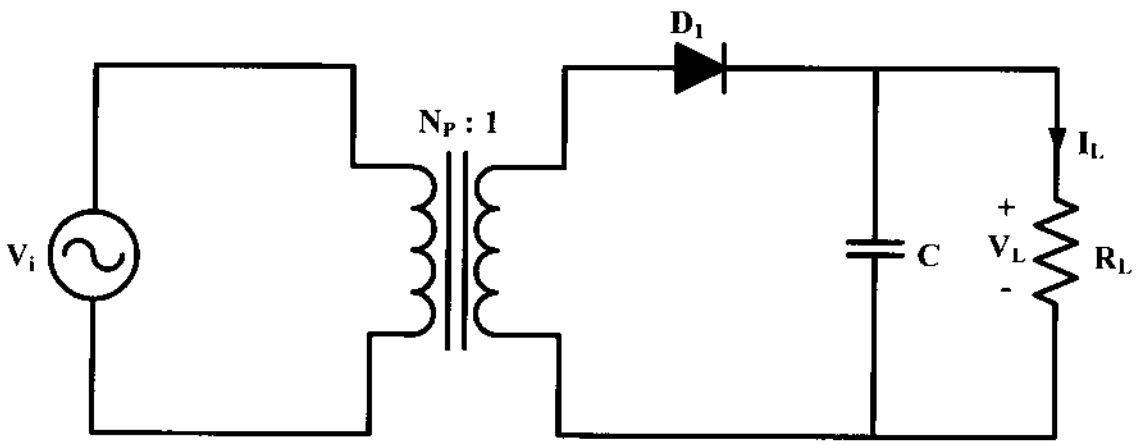

FIGURE Q5

- END OF QUESTION -