Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	ELECTRONIC DEVICES AND CIRCUITS II / ELECTRONIC DEVICES AND CIRCUITS
COURSE CODE	:	BNR 25903 / BNR 22303
PROGRAMME CODE	:	BNE
EXAMINATION DATE	:	JUNE / JULY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

Q1 (a) Explain the significance of zero output impedance and infinite input impedance of an ideal op-amp.

(2 marks)

(b) Refer to amplifier circuit in **Figure Q1(b)**.

(i) Calculate all voltage drops with polarity markings.

(2 marks)

(ii) Calculate all currents and show the current direction.

(2 marks)

(iii) Calculate the overall voltage gain, A_V as a ratio and as in decibel unit.

(2 marks)

(c) (i) For the circuit in **Figure Q1(c)(i)**, calculate the feedback current, I_L.

(2 marks)

(ii) For the circuit in **Figure Q1(c)(ii)**, calculate the output voltage, Vo.

(2 marks)

(d) Analyze the circuit in **Figure Q1(d)** and sketch the output voltage versus time graph for the given input voltage.

(8 marks)

Q2 (a) Explain with the diagram crossover distortion situation that usually occur in class B amplifier. Suggest a component to be added in order to reduce the crossover distortion.

(5 marks)

(b) Sketch the collector current waveform when amplifier operating as class A, class B, class C and class AB.

(4 marks)

(c) The input voltage of the power amplifier for the **Figure Q2(c)** is 8 V_{rms}. Calculate:

(i) Power input, P_i (dc).

(2 marks)

(ii) Power output, P_o (ac).

(2 marks)

(iii) Efficiency, % η.

(2 marks)

(iv) Power dissipated by both power output transistors.

(2 marks)

(d) A 2N3055 power transistor dissipates 20 W during operation. The amplifier circuit is designed to operate over an ambient temperature range of 0°C to 80°C. The worse case condition exists when the ambient temperature is 80°C. The temperature case to heat sink thermal resistance is 0.5°C/W and the heat sink is rated for a thermal resistance of 3°C/W. Calculate the case temperature of the transistor for worst case operating conditions.

(3 marks)

Q3 (a) Analyze the operation of the circuit in **Figure Q3(a)**.

(4 marks)

(b) Digital-to-analog conversion can be achieved using a number of different methods. One popular scheme uses a network of resistors called a ladder network. Sketch a ladder network using 01101 input and 15 kΩ resistors.

(5 marks)

(c) Draw the circuit of a one-shot using a 555 timer to provide one time period of 20 μs. If R_A = 7.5 kΩ, determine the value of capacitor, C.

(5 marks)

(d) **Figure Q3(d)** shows the phase-locked loop (PLL) connected to work as a FM demodulator.

(i) Calculate the center frequency of the circuit.

(1 marks)

(ii) Find the value of capacitor, C_1 in the circuit to obtain a center frequency of 100 kHz.

(2 marks)

(iii) Find the lock range for R_1 = 4.7 kΩ and C_1 = 0.001 μF.

(3 marks)

Q4 (a) Describe the principles of oscillator operation in electronic systems by using a diagram.

(4 marks)

(b) State **TWO (2)** types of sine wave oscillator. Define **TWO (2)** examples for each of oscillator.

(4 marks)

(c) For the circuit shown in **Figure Q4(c)**,

(i) Find t_H and t_L for the output, V_O.

(3 marks)

(ii) Determine the duty cycle.

(1 marks)

(iii) Clearly draw and label the waveforms of V_C and V_O.

(3 marks)

(d) Design a phase-shift oscillator for a frequency of 800 Hz. The capacitors value is 10 nF.

(5 marks)

Q5 (a) With the aid of diagram, show the relation between V_o, V_{in}, V_{ut} and V_{lt} of Scmitth trigger transfer characteristic.

(4 marks)

(b) **Figure Q5(b)** shows the circuit of a Schmitt Trigger and its transfer characteristic respectively. Based on these figures, determine V_{REF} and R_2.

(5 marks)

(c) Transfer function for two types of active filter are:

$$H(s) = \frac{28.3 \times 10^8}{2s^2 + (5.684 \times 10^4)s + (8.08 \times 10^8)}$$

$$H(s) = \frac{6.25s^2}{2.5s^2 + (2.222 \times 10^4)s + (9.875 \times 10^7)}$$

(i) List type of filter for each transfer function.

(2 marks)

(ii) Find the cut-off frequency for each filter.

(3 marks)

(d) Design a second order low pass Butterworth filter with cut-off frequency of 1 kHz. Select $C = 0.0047$ μF. Then, draw the frequency response of the circuit.

(6 marks)

- END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER / SESSION	: SEM II / 2018/2019	PROGRAMME CODE	: BNE
COURSE NAME	: ELECTRONIC DEVICES AND CIRCUITS II / ELECTRONIC DEVICES AND CIRCUITS	COURSE CODE	: BNR 25903 / BNR 22303

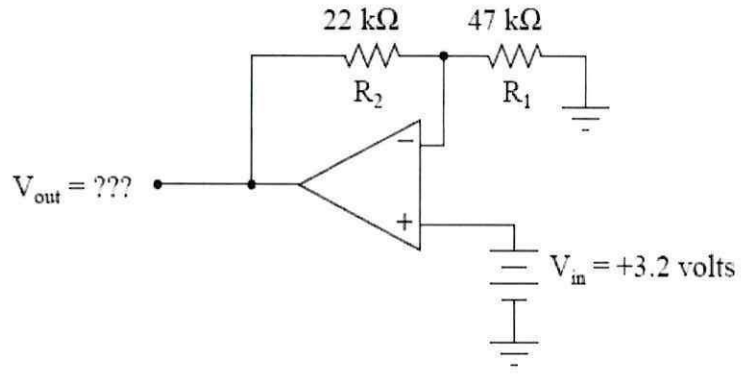

Figure Q1(b)

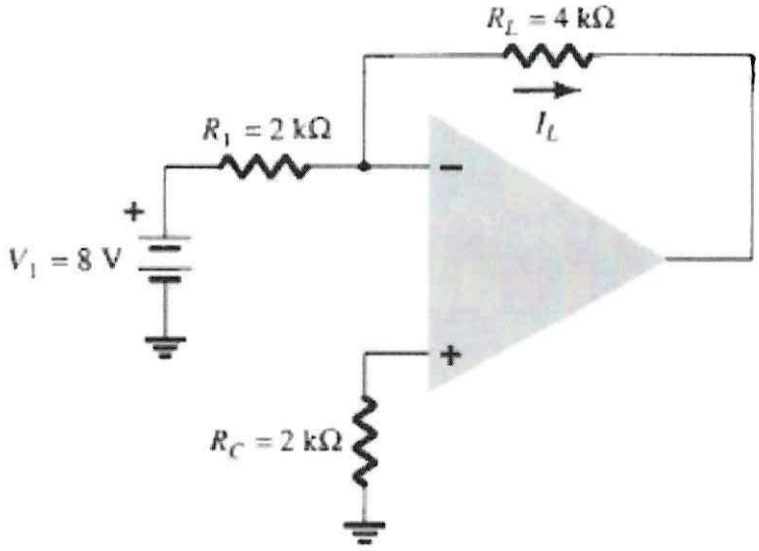

Figure Q1(c)(i)

FINAL EXAMINATION

SEMESTER / SESSION	: SEM II / 2018/2019	PROGRAMME CODE	: BNE
COURSE NAME	: ELECTRONIC DEVICES AND CIRCUITS II / ELECTRONIC DEVICES AND CIRCUITS	COURSE CODE	: BNR 25903 / BNR 22303

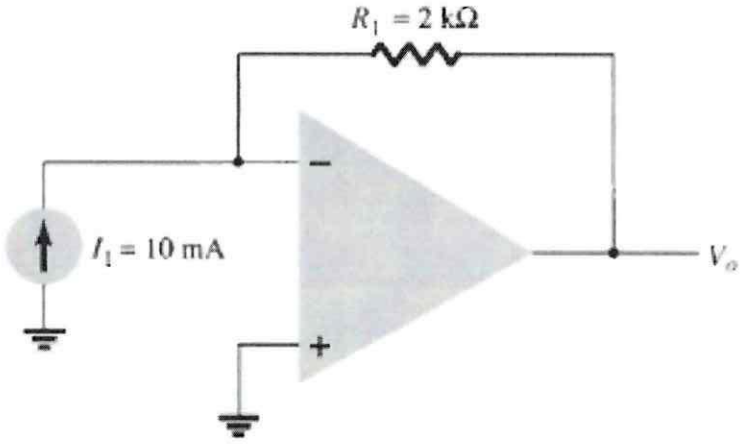

Figure Q1(c)(ii)

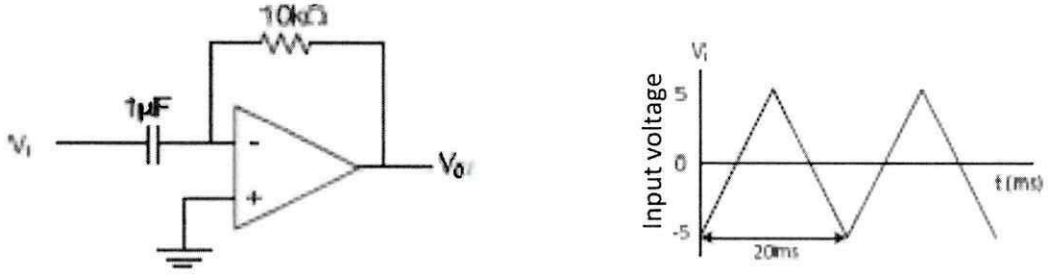

Figure Q1(d)

FINAL EXAMINATION

SEMESTER / SESSION	: SEM II / 2018/2019	PROGRAMME CODE	: BNE
COURSE NAME	: ELECTRONIC DEVICES AND CIRCUITS II / ELECTRONIC DEVICES AND CIRCUITS	COURSE CODE	: BNR 25903 / BNR 22303

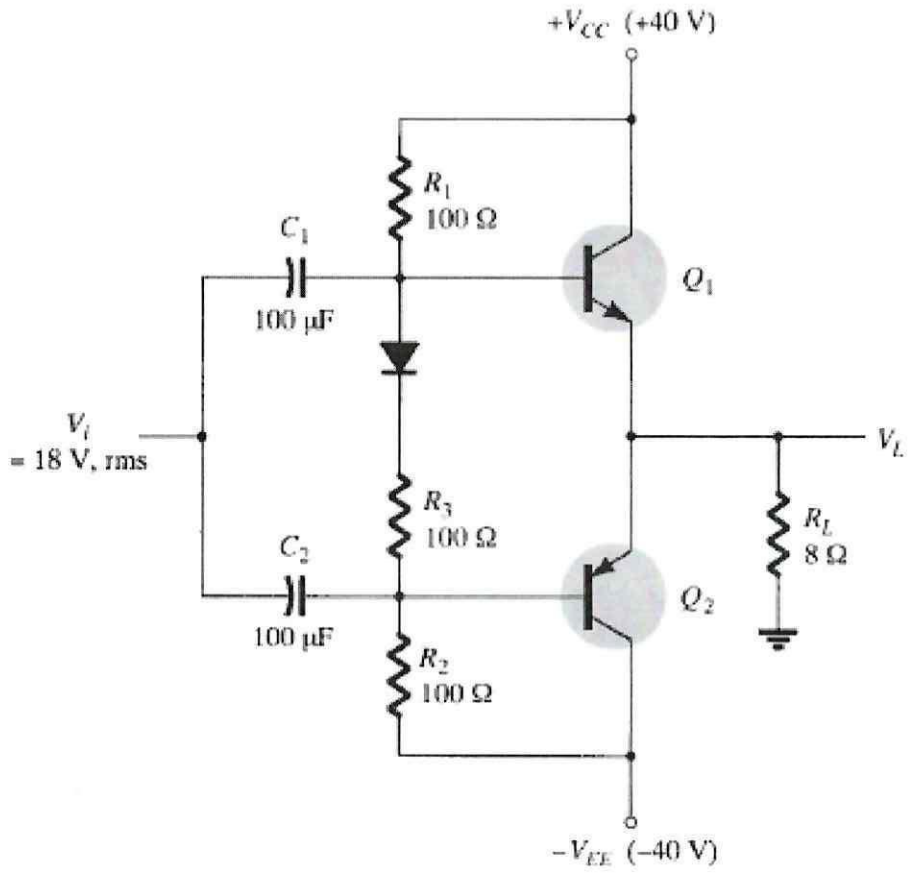

Figure Q2(c)

FINAL EXAMINATION

SEMESTER / SESSION	: SEM II / 2018/2019	PROGRAMME CODE	: BNE
COURSE NAME	: ELECTRONIC DEVICES AND CIRCUITS II / ELECTRONIC DEVICES AND CIRCUITS	COURSE CODE	: BNR 25903 / BNR 22303

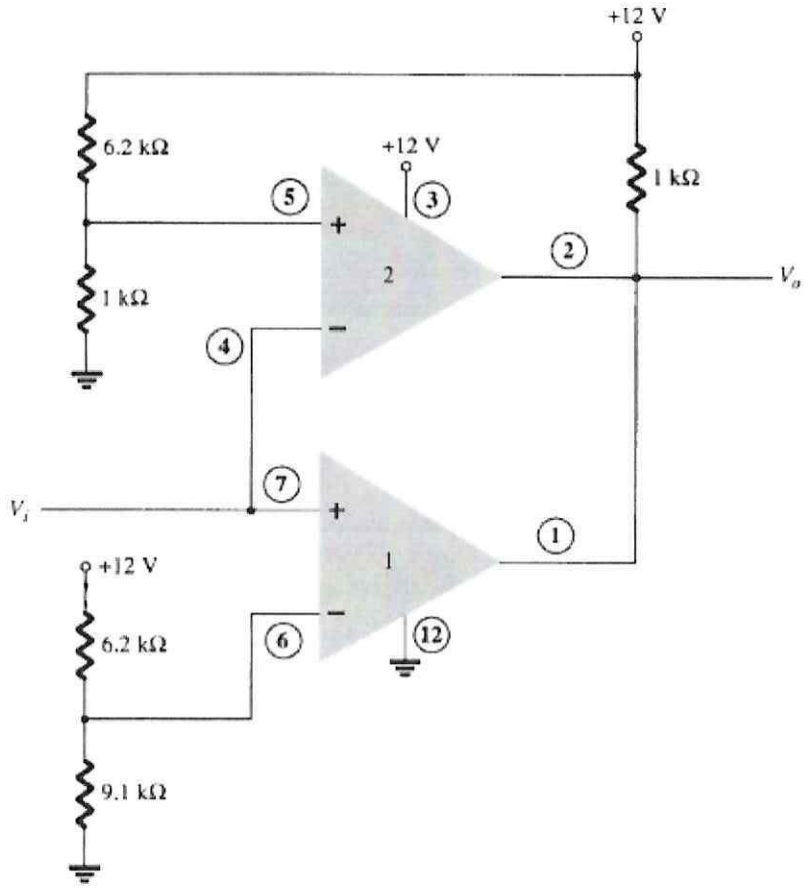

Figure Q3(a)

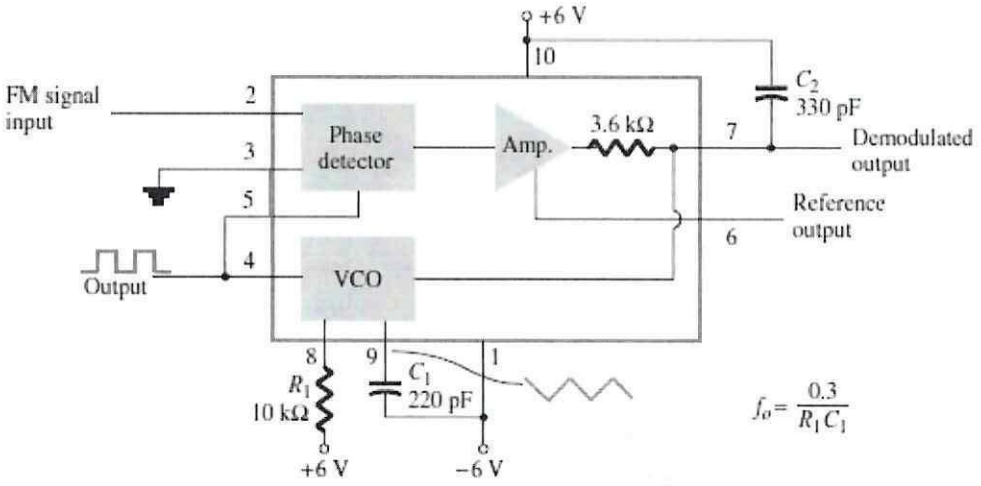

Figure Q3(d)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2018/2019
COURSE NAME : ELECTRONIC DEVICES AND CIRCUITS II / ELECTRONIC DEVICES AND CIRCUITS
PROGRAMME CODE : BNE
COURSE CODE : BNR 25903 / BNR 22303

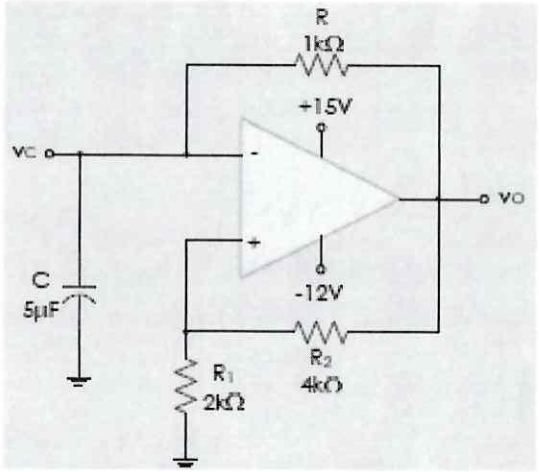

Figure Q4(c)

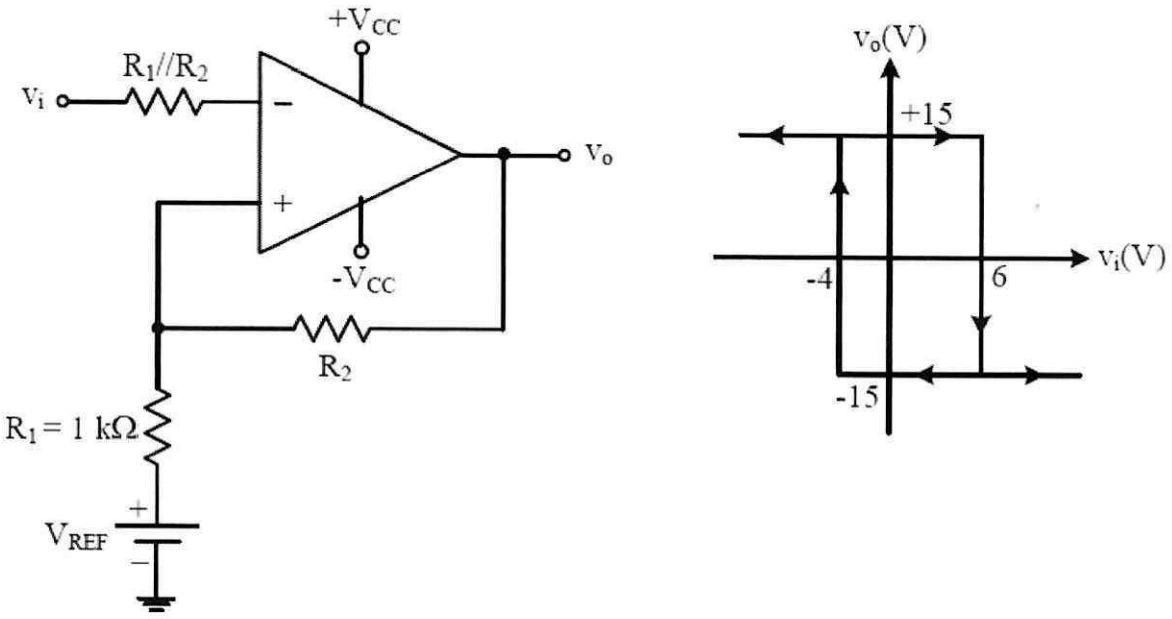

Figure Q5(b)