FIJI NATIONAL UNIVERSITY

College of Engineering, Science and Technology (CEST)

School of Electrical & Electronic Engineering

FINAL EXAMINATION 2013

Program	**Diploma in Electrical & Electronics Engineering**
Semester	**1**
Unit Code	**EEE503**
Unit Title	**Analogue Electronics 2B**
Date of Examination	**Refer ETT**
Time	**Refer ETT**
Venue	**Refer ETT**
Duration	**2 hours** (Extra 10 minutes allowed for reading the paper)
Maximum Marks	**100**

Instructions:

1. Attempt ALL questions in this examination booklet.
2. Write your answers legibly in the answer booklet.
3. Write your student identification number on each page used.
4. There are five (5) questions in total worth 20 marks each.

GOOD LUCK!

Question 1 - 20 marks

A. Fill in the blanks **10 marks**

Description	**Component**
1. A fixed gain monolithic power amplifier	_____ (1 mark)
2. In the power amplifier circuit, these transistors provide the input buffering	_____ (2 marks)
3. These 2 resistors provide dc paths to ground for the base currents	_____ (2 marks)
4. These transistors act as a current booster	_____ (2 marks)
5. Name the transistor that sinks the additional load current	_____ (1 mark)
6. State the percentage of distortion at which peak clipping begins	_____ (2 marks)

B. With the aid of a diagram, explain the importance of utilizing heat-sinks in electronic circuits? **10 marks**

Question 2 – 20 marks

A. It is required to design a tuned amplifier having f_o = 1MHz, 3dB bandwidth = 10kHz and centre-frequency gain = -10V/V. The FET available has at the bias point g_m = 5mA/V and r_o = 10kΩ. The output capacitance is negligibly small. Determine the values of:

i. R_L (1 mark)
ii. C_L and (2 marks)
iii. L (2 marks)

B. Define the following terms:

i. Skirt selectivity (1 mark)
ii. Narrow-band (1 mark)
iii. Closed loop gain (1 mark)

C. State two (2) applications of coupling capacitors (2 marks)

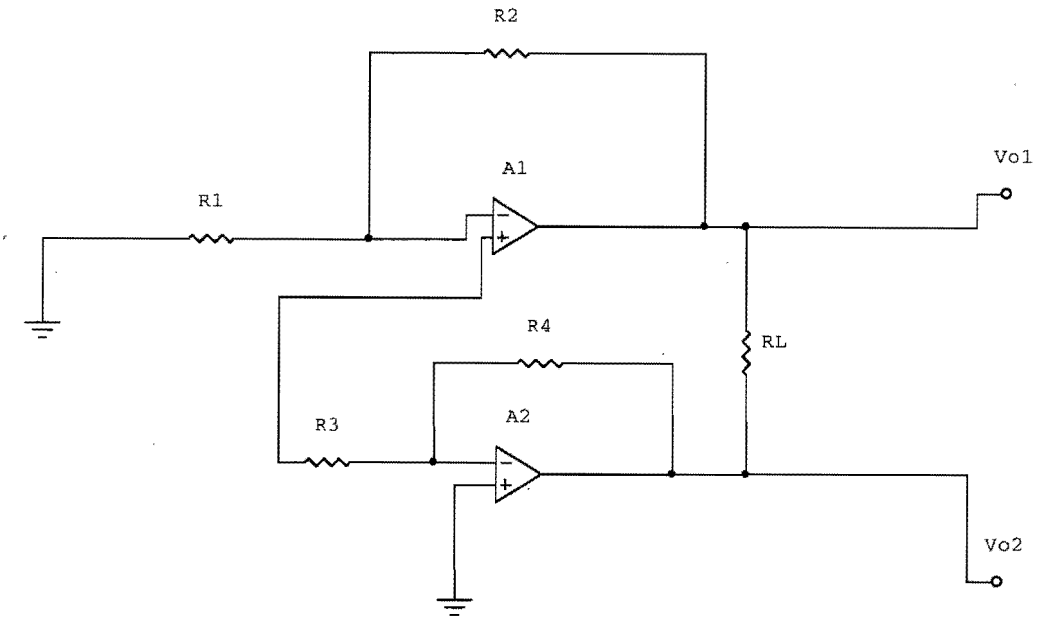
D. Feedback can be either negative or positive. State five (5) properties when designing amplifiers that would bring about negative feedback. (5 marks)

E. The manufacturer specifies that for ambient temperatures below 25°C the LM380 can dissipate a maximum of 3.6W. This is obtained under the condition that its dual-in-line package be soldered onto a PCB in close thermal contact with 6sq. inches of 2-ounce copper foil. Above the ambient temperature of 25°C, the thermal resistance is Θ_{JA} = 35°C/W. T_{Jmax} is specified to be 150°C. Find the maximum power dissipation possible if the ambient temperature is to be 50°C. (5 marks)

Question 3 – 20 marks

A. i) Draw and fully label the Cathode-Ray-tube. (5 marks)
ii) Describe the operation of each part of the tube drawn in part (i) (5 marks)

B. Consider this circuit



The component values are: $R_1 = R_3 = 10k\Omega$, $R_2 = 5k\Omega$, $R_4 = 15k\Omega$, and $R_L = 8\Omega$. Find the

i) voltage gain and (2 marks)

ii) the input resistance. (2 marks)

iii) The power supply used is ±18V and if v_i is a 20-V peak-to-peak sine wave, what is the peak-to-peak output voltage? (2 marks)

iv) What is the peak load current? (2 marks)

v) What is the load power? (2 marks)

Question 4 – 20 marks

A. Design the RC elements of a Wien Bridge oscillator that oscillates at f_o = 25kHz and clearly state all assumptions and justifications. Construct and clearly label the Wien Bridge circuit using an op-amp. (5 marks)

B. Design an RC Phase-shift oscillator that will oscillate at 100Hz. (Take C = 0.5μF). (2 marks)

C. Draw and label the basic oscillator block diagram and explain how the oscillator works. (3 marks)

D. State the Barkhausen Criterion both mathematically and theoretically. (4 marks)

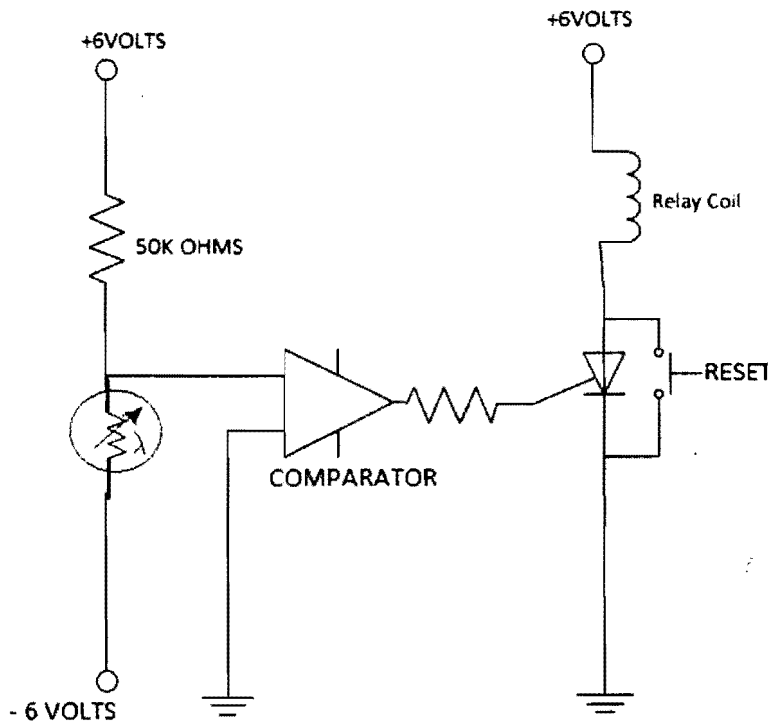
E. Describe the operation of a monostable op-amp circuit. Clearly label the circuit diagram and indicate both input and output waveforms. (6 marks)

Question 5 – 20 marks

A. With the aid of a fully labelled construction diagram of a liquid-crystal display, explain the components that make-up the LCD. (8 marks)

B. Explain the two (2) fundamental ways in which liquid-crystals are used to control properties of light and thereby alter its appearance. (4 marks)

C. For the circuit shown below,



when the photoconductive cell is illuminated by a light beam, it has a resistance of 20kΩ. The dark resistance is 100kΩ. Show that the relay is de-energized when the cell is illuminated and energized. (4 marks)

D. State a distinguishing feature of the following components:

i)	Light-emitting diode (LED)	(1 mark)
ii)	Optoisolator	(1 mark)
iii)	Photodiode	(1 mark)
iv)	Solar cells	(1 mark)

END.