



COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRONICS ENGINEERING-STAGE 3

UNIT CODE: EEC404

TITLE: ANALOGUE ELECTRONICS 2

FINAL EXAMINATION – QUARTER 3, 2019

ROOM: AS PER TIMETABLE

TIME: 2 HOURS 10 MINUTES

INSTRUCTIONS TO STUDENTS

1. You are allowed 10 minutes extra reading time during which you are NOT to write.
2. Begin each SECTION on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. **ANSWER ALL QUESTIONS**
9. Show all working where necessary.
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.**

SECTION A

MULTIPLE CHOICE

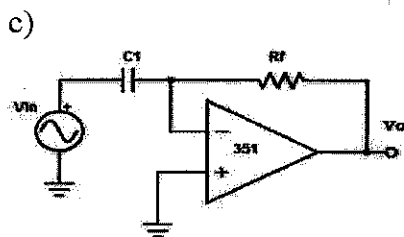
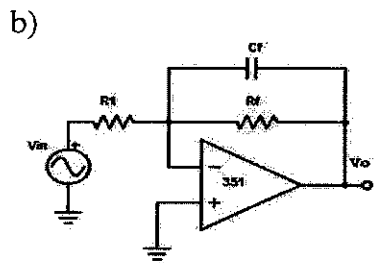
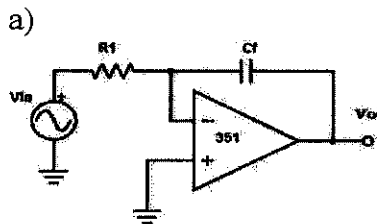
(10 MARKS)

Beside each question number write the corresponding alphabet that best represents your answer

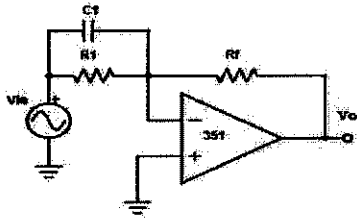
1. For an oscillator to properly start, the gain around the feedback loop must be _____.
 - a) 1
 - b) Less than 1
 - c) Equal to attenuation of feedback circuit
 - d) Greater than 1

2. An oscillator converts _____.
 - a) a.c. power into d.c. power
 - b) d.c. power into a.c. power
 - c) mechanical power into a.c. power
 - d) a) and b) above

3. Select the “differentiator” circuit from the circuits given below?



d)



4.

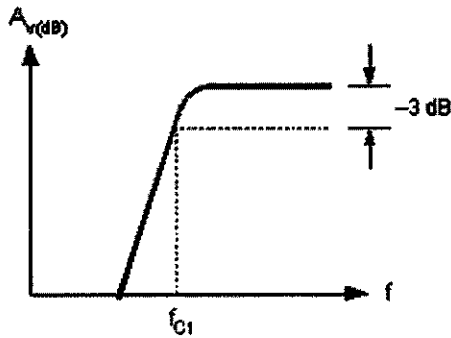
For an Op-amp with negative feedback the output is _____.

- a) equal to input
- b) increased
- c) feed back to the inverting input
- d) feed back to the non-inverting input

5. A tuned amplifier is generally operated in operation.

- a) Class A
- b) Class C
- c) Class B
- d) All of the above

6. Determine the type of active filter frequency-response curve shown below:



- a) High-pass filter
- b) Band-pass filter
- c) Band-stop filter
- d) Low-pass filter

7. An SCR is sometimes called

- a) Triac
- b) Diac
- c) Unijunction transistor
- d) Thyristor

8. An LED is forward-biased. The diode should be on, but no light is showing. A possible trouble might be _____
- a) The diode is open.
 - b) The series resistor is too small.
 - c) None, the diode should be off if forward-biased.
 - d) The power supply voltage is too high.
9. An SCR is turned off by
- a) Reducing gate voltage to zero
 - b) Reverse biasing the gate
 - c) Reducing anode voltage to zero
 - d) None of the above
10. The circuit in which the output voltage waveform is the differential of the input voltage waveform is called _____.
- a) Integrator
 - b) Differentiator
 - c) Phase shift oscillator
 - d) Square wave generator

SECTION B

[90 MARKS]

PART 1: OPERATIONAL AMPLIFIERS

(20 MARKS)

1. Match List A with List B

(6 marks)

LIST A		List B	
i.		A	Differentiator
ii.		B	Summing Amplifier
iii.		C	Integrator
iv.		D	Inverting
v.		E	Non - investing
vi.		F	Unity follower

- 2).
 - i). Define the term “slew rate” as referred to operation amplifier? (2 Marks)
 - ii). Calculate the maximum frequency of the OPAM if the slew rate is $0.5 \text{ V}/\mu\text{s}$ and the peak to peak voltage is 16 V ? (2 Marks)
- 3).
 - i). Explain the term “input offset voltage’ of an OPAM (2 Marks)
 - ii). What are the factors that affects the “output voltage” of an OPAM? (2 Marks)

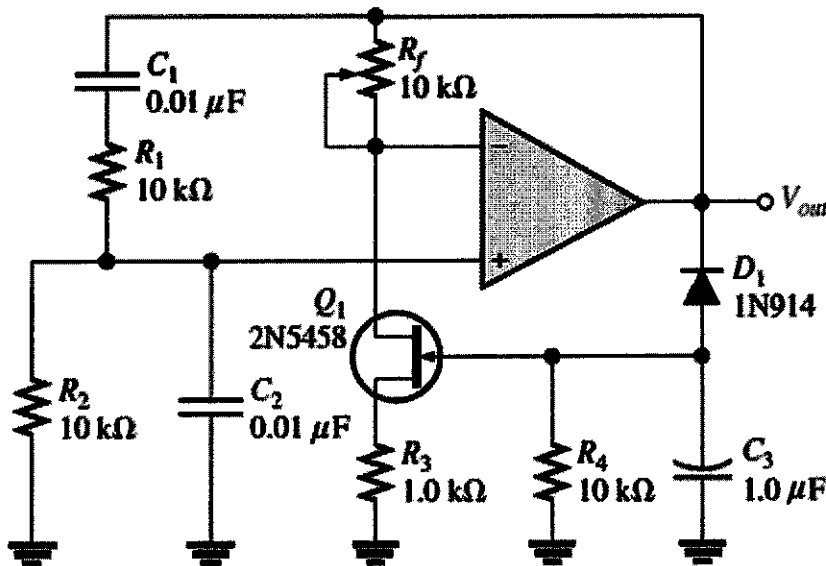
4). Determine the Closed loop Voltage Gain of the following circuits:

- i). inverting amplifier
- ii). Non- inverting amplifier
- iii). Voltage Follower

(6 marks)

PART II: OSCILLATORS & WAVEFORM GENERATORS (25 MARKS)

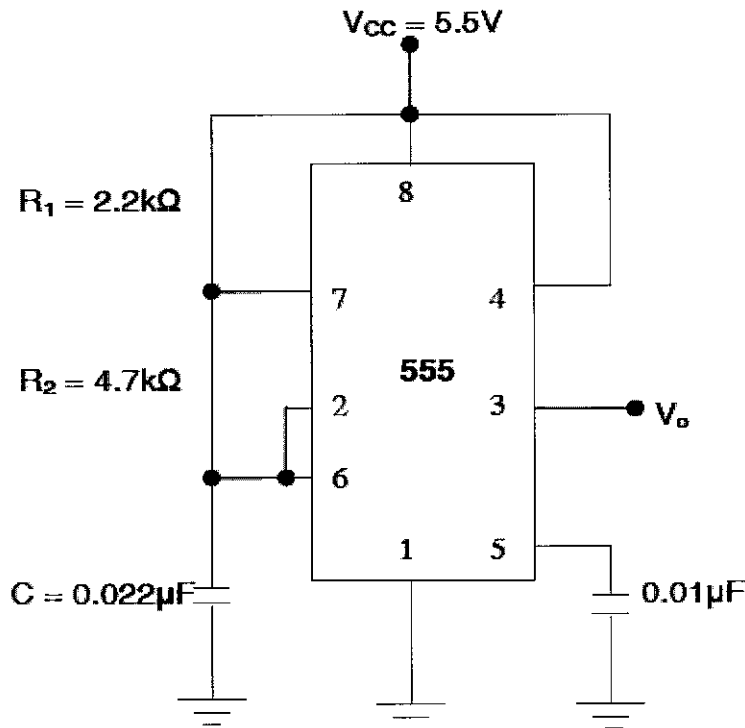
1. Discuss what an oscillator is and list down the systems where they are normally used in? (2 Marks)
2. Draw and label a block diagram of an oscillator circuit and identify the inputs and outputs and in your own words explain its operation? (5 Marks)
3. What type of feedback is used in oscillators and explain (2 Marks)
4. What are the 2 conditions that must be satisfied by an oscillator circuit to sustain oscillation? (2 Marks)
5. Refer to the oscillator circuit below.



- i). Identify the type of oscillator circuit?
- ii). Calculate the resonance frequency.

(1 Marks)
(2 Marks)

6. At resonance the capacitive reactance and the Inductive reactance of an LC oscillator are equal, derive the frequency of resonance? (2 Marks)
7. A phase shift oscillator uses 5 pF capacitors. Find the value of R to produce a Frequency of 1 MHz? (2 Marks)
8. What is a crystal and state its advantage? (2 Marks)
9. For the circuit shown below, calculate the:
 a. The output frequency of the oscillator. (3 marks)
 b. The duty cycle of the output waveform. (2 marks)



Hint:

$$f_r = \frac{1.44}{(R_1 + 2R_2)C_{ext}} \quad \text{555 astable frequency}$$

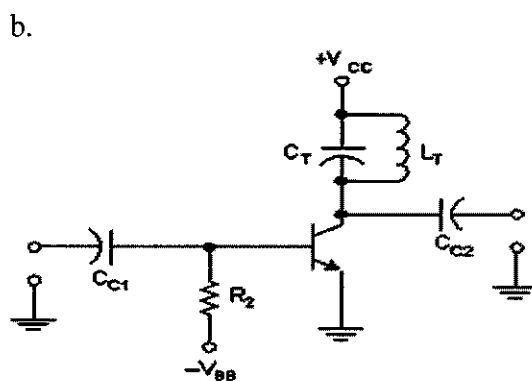
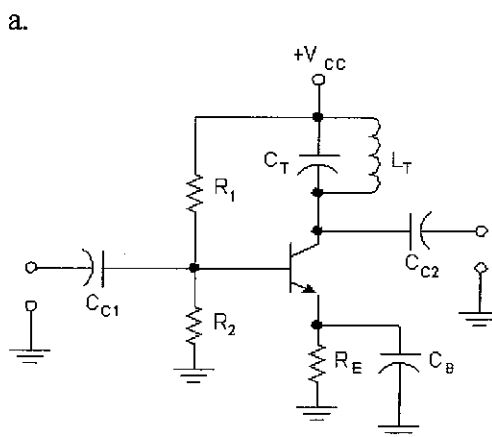
$$\text{Duty cycle} = \left(\frac{R_1 + R_2}{R_1 + 2R_2} \right) 100\% \quad \text{555 astable}$$

PART III:

TUNED AMPLIFIERS

(15 MARKS)

1. What kind of circuits are tuned amplifier? (2 marks)
2. List down some applications of a tuned amplifier? (2 marks)
3. Find the Q factor of a tuned circuit that has resonant frequency of 1600 kHz and bandwidth of 20 kHz? (2 marks)
4. Tuned op-amp circuits are generally referred to as active filters. There are four basic types of active filters. List down the four types of active filters and sketch the frequency-response curves. (6 marks)
5. What is the function of a graphic equalizer? (1 mark)
6. Identify and name the circuit diagrams below: (2 marks)



PART IV: OPTOELECTRONICS

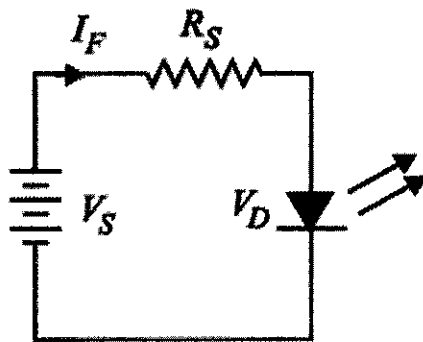
(15 MARKS)

1. Define the following terms:
 - a. Light Emitting (1 mark)
 - b. Light Activated (1 mark)
 - c. Optoelectronics (1 mark)

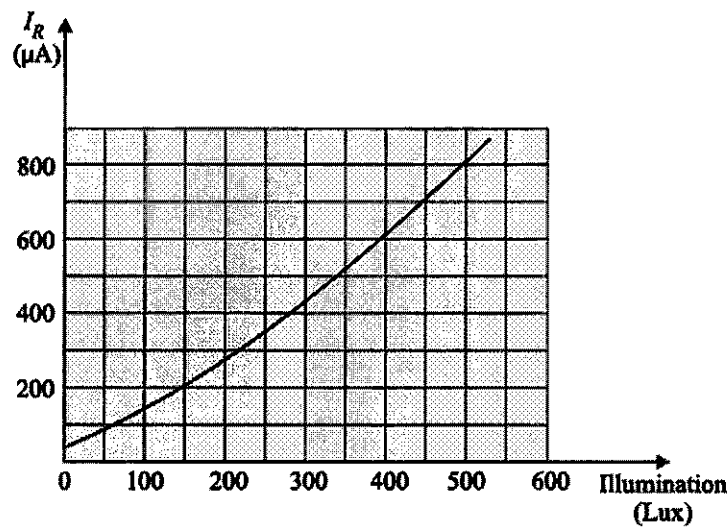
2. List three advantages of LED. (3 marks)

3. Draw the circuit symbols for the following: (4 marks)
 - a. phototransistor
 - b. photodiode
 - c. LED
 - d. photo-darlington

4. What value of series resistor is required to limit the current through a LED to 20mA with a forward voltage drop of 1.8V when connected to a 12V supply? (2 marks)



5. From the reverse current-Illumination curve for a photo-diode shown in Figure below, determine the dark resistance. Assume a reverse-biased voltage of 10 V. (3 marks)

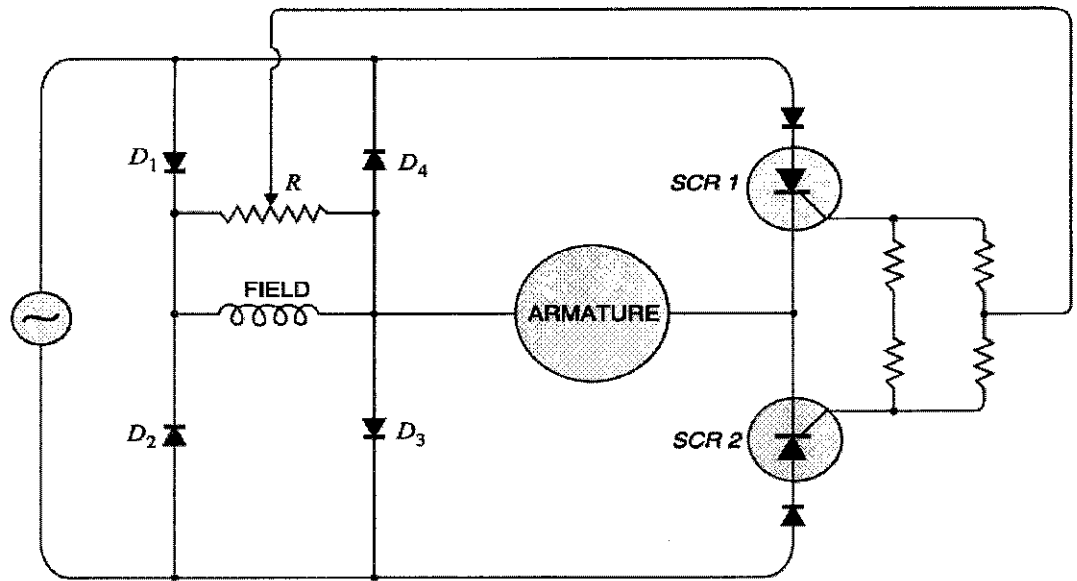


PART V:

THYRISTORS

(15 MARKS)

1. What are the two ways to drop the SCR out of conduction? (2 marks)
2. What is the purpose of a crowbar circuit? (1 mark)
3. Draw the circuit symbols of a Triac, SCR and Diac. (3 marks)
4. Give two application of SCR. (2 marks)
5. During the positive half-cycle of the ac, the triac is off for 12° . Calculate the following:
 - a) Delay angle (1 mark)
 - b) Conduction angle (1 mark)
6. The circuit shown below can be used to control the speed of a d.c shunt motor. Explain the operation of this circuit? (5 marks)



*****THE END*****