



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

THIRD YEAR SECOND SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF TECHNOLOGY EDUCATION
IN
ELECTRICAL AND ELECTRONIC ENGINEERING**

COURSE CODE: TEE 322

COURSE TITLE: ANALOGUE ELECTRONICS II


DATE : 14TH APRIL 2023

TIME: 3:00 PM - 5:00 PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

TIME: 2 Hours

MMUST observes ZERO tolerance to examination
cheating 

SECTION A: COMPULSORY

Q. 1

- a) Draw the circuit diagram of the voltage series feedback amplifier and derive the close loop Voltage gain, gain of feedback circuits' input resistance, and output resistance, bandwidth and total output offset voltage **[8 marks]**
- b) Sketch typical output characteristics for a common emitter transistor and illustrate the region where the transistor is said to be *saturated*. What bias condition exists at the collector-base junction (V_{CB}) when a transistor operates in the saturated region? **[6marks]**
- c) Explain why the output voltage of a common emitter transistor amplifier is 180° out of phase with the input voltage. **[6 marks]**
- d) With the aid of a circuit diagram, explain the role of capacitors in Multistage amplifier system **[6 marks]**
- e) Differentiate between Small signal Amplifiers and Large signal amplifiers **[4 marks]**

SECTION B: ANSWER ANY TWO OF THE FOUR QUESTIONS

Q. 2

(a) Draw the circuit diagram of a simple zener diode regulator and briefly explain how the circuit minimizes the effects of supply voltage variations on the load voltage. **[8**

Marks]

(b) A zener diode has a reverse breakdown voltage of $4.7V$ and may be considered a linear resistance of 4Ω for voltages beyond this value. It is to be used in a simple voltage regulator circuit to maintain $5.0V$ across a 200Ω load from a nominal $10V$ supply.

I Calculate a suitable value of series resistor.

II Determine the power dissipated in the series resistor **and** in the diode.

III Calculate the change in load voltage if the supply voltage increases by 10%. **[12 Marks]**

Q. 3

a) State the two basic purposes of a coupling device.

[2 Marks]

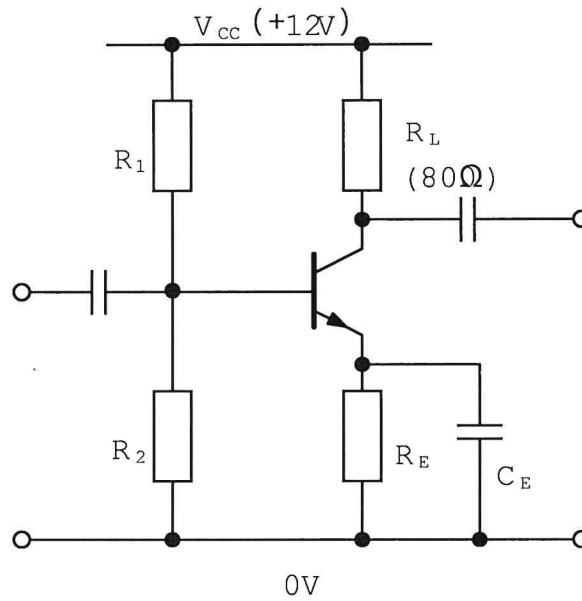


Figure 1

- b)
- I Explain what is meant by *stabilization of the operating point* and how it is achieved in the amplifier of Figure 1.
 - II Explain the function of each of the five labelled components in Figure 1. [12 Marks]
- c) Explain the resistance-capacitance coupling method [6 Marks]

Q. 4

a. The output characteristics of an NPN transistor are tabulated below (assumed to be linear over the given range).

I_B (μA)	$I_C(mA)$ @ V_{CE} equal to:-	
	2V	10V
30	1.5	1.8
50	3.0	3.5

70	4.5	5.8
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The transistor is to be used in the common emitter mode with a resistive load of $2\text{ k}\Omega$ and a supply voltage of 12V .

- I. Plot the output characteristics and draw the load-line on graph paper. [5Marks]
- II. Calculate the amplifier ac current gain for an input base current of $40\mu\text{A}_{p.p.}$. Varying sinusoidally about a mean value of $50\mu\text{A}$. [6 Marks]
- III. Calculate the ac voltage gain if the ac input resistance is 1400Ω . [3Marks]

b.

I Describe tuned amplifiers

[3Marks]

- II Show that the resonance frequency of a tuned amplifier is given by [3Marks]

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

Q5.

- a) Differentiate between an alternator and an oscillator [6Marks]
- b) State and briefly describe the four types of sinusoidal oscillators [6Marks]
- c) With the aid of circuit diagrams, differentiate between Hartley and Colpitt Oscillators [8Marks]