



MACHAKOS UNIVERSITY

University Examinations for 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR BACHELOR OF SCIENCE (ELECTRICAL AND ELECTRONICS ENGINEERING)

EEE 308: ANALOGUE ELECTRONIC-I

DATE:

TIME:

Instructions to candidates:

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

Write your college number on the answer sheet.

This paper consists of 3 printed pages

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

QUESTION ONE [30 Marks]

- a) Explain how semiconductors can be operated as a conductor. [2Marks]
- b) Define the following terms: [3Marks]
 - i. Maximum forward current
 - ii. Peak inverse voltage
 - iii. Maximum power rating
- c) An A.C voltage of peak value 20V is connected in series with a silicon diode and load resistance of 550Ω. If forward resistance of diode is 15Ω, Find: [4Marks]
 - i. Peak current through the diode
 - ii. Peak output voltage
- d) Derive an expression describing efficiency for half wave rectifier. [3Marks]
- e) Describe how zener diode act as a voltage stabilizer. [3Marks]
- f) Deduce an expression describing collector current. [4Marks]
- g) To achieve 100% amplification, what are the key factors that have to be accomplished. [3Marks]
 - ii. Explain the need of stabilization in the transistor. [3Marks]
- h) Explain the following terms: [2Marks]
 - i. **d.c.** load line
 - ii. **a.c.** load line
- i) Explain the classification of transistor amplifier. [3Marks]

QUESTION TWO [20 Marks]

- a) Describe how the pn junction is formed hence explain the formation of potential barrier in a pn junction. [5Marks]
- b) Explain the principle of full wave rectifier hence determine the output of d.c voltage and peak inverse voltage when an A.C supply of 230V is applied to full rectifier through a transformer of turn ratio 10:1. Assume the diode to be an ideal. [10Marks]
- c) Describe the mechanism of electron current flow in a semiconductor. [5Marks]

QUESTION THREE [20 MARKS]

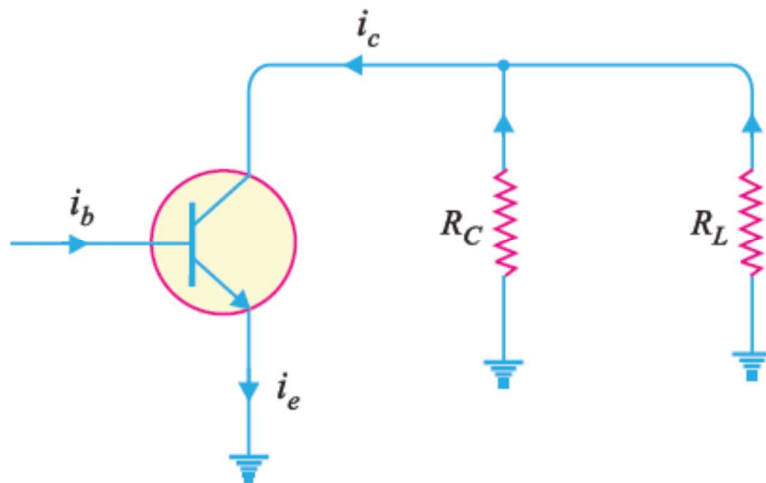
- a) In common Emitter connection, describe the relationship between β and α . [6Marks]
- b) Explain the characterisitc of common base connection using illustration. [8Marks]
- c) With an aid of circuit diagram, explain bridge full wave rectifier. [6Marks]

QUESTION FOUR [20 MARKS]

- a) Explain any two devised technique involved in transistor biasing. [16Marks]
- b) A germanium transistor is to be operated at zero signal $I_C = 2\text{mA}$. If the collector supply $V_{CC} = 10\text{V}$, What is the value of R_B in the base resistor method? Take $\beta = 120$. If another transistor of the same batch with $\beta = 60$ is used, what will be the new value of zero signal I_C for the same R_B ? [4Marks]

QUESTION FIVE [20 Marks]

- a) For the transistor shown below, $R_1 = 15\text{K}\Omega$, $R_E = 5\text{K}\Omega$ and $R_L = 2\text{K}\Omega$. [6Marks]
- (i) Draw the d.c load line (ii). Determine the operating point
- iii. Draw a.c load line. Assume $V_{BE} = 0.7\text{V}$



- b) Illustrate the phenomenon of phase reversal in CE amplifier assuming typical circuit values. [4Marks]
- c) For the transistor amplifier circuit shown below, determine : [10Marks]
- (i) d.c. load and a.c. load
- (ii) maximum collector-emitter voltage and collector current under d.c. conditions

- (iii) (maximum collector-emitter voltage and collector current when a.c. signal is applied)

