BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS AND PHYSICS

ANALOGUE ELECTRONICS 1

EEE2104/EEE1211

Examination Paper **[1]**

This examination paper consists of 2pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Calculator

NOV 2024

INSTRUCTIONS

1. **Answer any FOUR questions only.**
2. **Each question carries 25 marks.**
3. **Show your steps clearly in any calculation.**
4. **Start the answers for each question on a fresh page.**

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25
6.	25
TOTAL	100

Question 1

a) Define the term bipolar in analogue electronics. [2 Marks]

b) Describe the constituents of the 3 layer semiconductor device. [4 Marks]

c) Outline the rules to be followed for BJT transistor be used as an amplifier. [6 Marks]

d) The parameters of transistor 2N3055 as follows:

- Maximum power dissipation @ 250C=115 W
- Derate factor=0.66 mW/^{0}C.
- This transistor used at temperature 78^{0}C.

i. Find the new maximum value of power dissipation. [6 Marks]

ii. Find the set of new maximum of I_C if V_{CE} = 10V, 20V and 40 V. [7 Marks]

Question 2

a) Explain the common-collector configuration of a transistor as an amplifier. [15 Marks]

b) Find the value of B for each transistor [10 Marks]

Question 3

a) Write short notes on fixed bias, Voltage-divider bias and Collector to Base Bias. [15 Marks]

b) Discuss the reasons which made Metal-oxide semiconductor field-effect transistor (MOSFET) to be extremely popular than BJT. [10 Marks]

Question 4

a) Describe the Field-Effect Transistors (FETs) device [10 Marks]

b) Diagrammatically describe the Darlington pair differential amplifier citing its advantages and disadvantages. [15 Marks]

Question 5

Make a presentation on Multistage amplifiers citing their coupling methods, frequency response, and applications [25 Marks]

Question 6

a) Write short notes on the following;

i. oscillators [5 Marks]

ii. R-C-shift types [5 Marks]

iii. Wien-bridge [5 Marks]

b) Determine the voltage gain, input resistance and the output resistance for a dual input, unbalanced-output differential amplifier whose specifications are:

R_C = 2.2 kΩ, R_B= 4.7 kΩ, $R_{In1} = R_{In2}$= 50Ω, $+V_{CC}$ = 10V, $-V_{EE}$= -10 V, β_{dc} =100 and V_{BE}= 0.715V. [10 Marks]