TEVETA

Technical Education, Vocational and Entrepreneurship Training Authority

DIPLOMA IN BIOMEDICAL ENGINEERING

LEVEL 6 YEAR II EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: JULY/AUGUST 2025

SUBJECT: ELECTRONICS II

TIME: THREE (3) HOURS **TOTAL MARKS 100**

PASS MARK 50

INSTRUCTIONS TO CANDIDATE

1. Write your Examination number and National Registration Card (NRC) number on the answer booklet provided. Ensure you append your signature in the space provided on the answer booklet.
2. Write the ANSWER SCRIPT SERIAL NUMBER on the examination register and on the entry slip.
3. There are EIGHT (8) questions in this paper. Answer FIVE (5) questions.
4. Diagrams may be used where necessary to clarify your answer.
5. Cell phones and programmable calculators are not allowed in the examination room.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

QUESTION 1

a) With the aid of a diagram, describe the operation of a transistor as an amplifier. [9 marks]

b) A CB transistor configuration has an input resistance of 20 Ω and an output resistance of 100 kΩ. If a signal of 500 mV is applied between the emitter and the base, find the voltage amplification factor. Assume α to be nearly zero. [2 marks]

c) Using the transistor current equation, Write the formulae for the three current gains of transistors. [9 marks]

[TOTAL MARKS 20]

QUESTION 2

a) Figure Q2 shows three transistors with open circuit faults. Describe the behavior of transistors in each case. [12 marks]

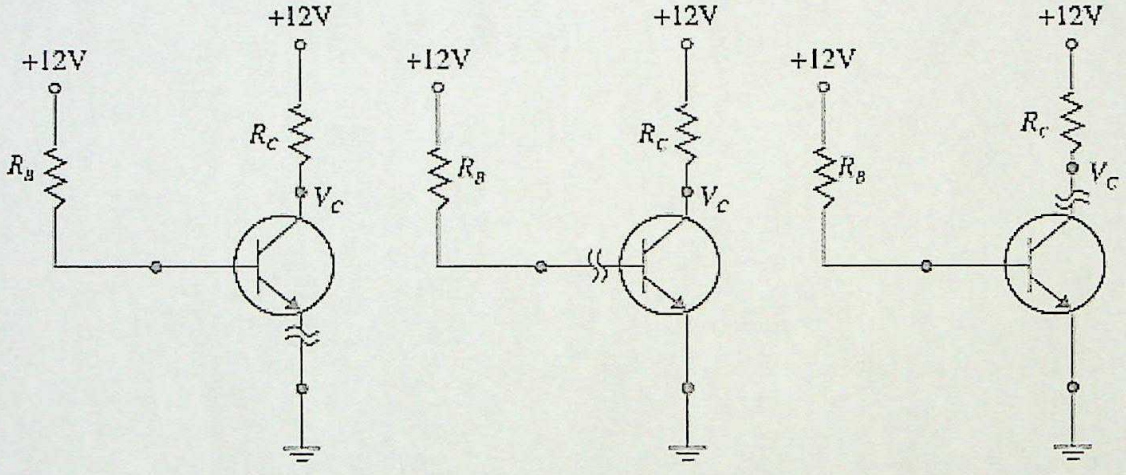


Figure Q2: Transistors

b) Explain the operation of a Common Emitter transistor under the following processes:

i) Injection process [3 marks]

ii) Diffusion process [3 marks]

iii) Collection process [2 marks]

[TOTAL MARKS 20]

QUESTION 3

a) If each transistor in Figure Q3 has a beta value of 100, determine the:

i) Overall current gain [2 marks]

ii) Base current of transistor Q_1 [4 marks]

iii) Input impedance at the base of transistor Q_1. [4 marks]

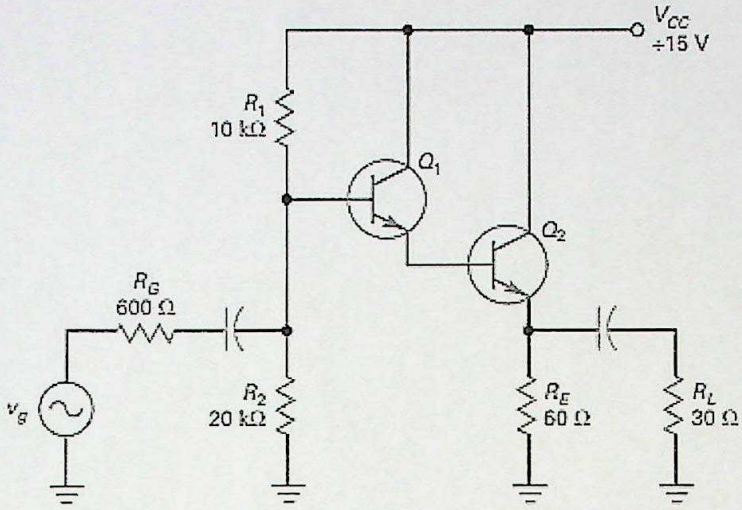


Figure Q3: Transistors

b) Explain the relevance of cascading a Common Emitter and a Common Collector in transistor amplifiers. [4 marks]

c) Explain **two (2)** methods you could employ in order to troubleshoot multistage amplifiers. [6 marks]

[TOTAL MARKS 20]

QUESTION 4

a) With the aid of the response curves, describe the following terms:

i) LPF [3 marks]

ii) BSF [3 marks]

iii) BPF [3 marks]

b) Design a High Pass Filter that a cut-off frequency of 4 kHz when R = 3kΩ. It is connected to a $10\angle 0^0$ variable frequency supply. Calculate the following:

i) Inductor of the Inductance L but of negligible resistance [3 marks]

ii) The inductor voltage and its decibel level at:

1. F = 0 [2 marks]
2. F = f_C [2 marks]
3. F = $2f_C$ [2 marks]
4. F = $10f_C$ [2 marks]

[TOTAL MARKS 20]

QUESTION 5

For the emitter – follower network of figure Q5, determine:

a) Emitter resistance, re' [4 marks]

b) Input impedance, Zi [2 marks]

c) Output impedance, Zo [2 marks]

d) Voltage gain, Av [2 marks]
e) Output voltage, Vo [2 marks]
f) Repeat part (b) through (e) with R_L = 25kΩ and comment on your results. [8 marks]

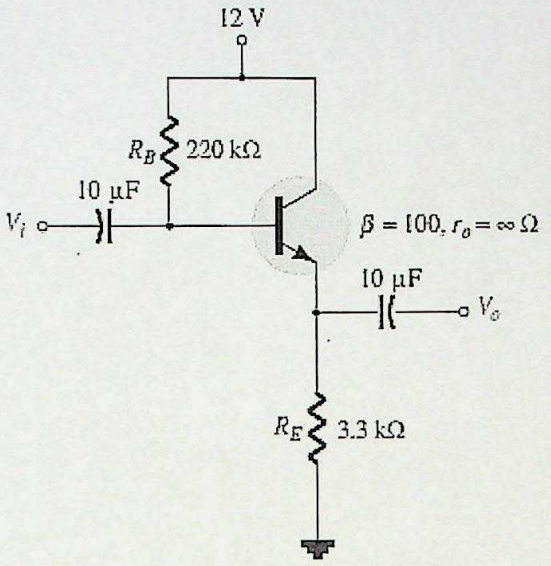


Figure Q5: emitter – follower network

[TOTAL MARKS 20]

QUESTION 6

Derive the expressions for the following types of Operational Amplifiers and use the expressions derived to find the output voltage when the input voltage is 2sin4t.

a) Integrator [10 marks]
b) Differentiator [10 marks]

[TOTAL MARKS 20]

QUESTION 7

a) Define current amplification factor. [2 marks]
b) Derive the expression for the collector current in a CE transistor configuration. [8 marks]
c) With the aid of a diagram, describe the operation of NPN transistor. [10 marks]

[TOTAL MARKS 20]

QUESTION 8

a) Explain the word "Cascade" as applied to amplifiers. [2 marks]
b) Indicate the **three (3)** common methods which are used for transistor coupling. [3 marks]
c) State the **two (2)** reasons for a coupling device in cascade amplifiers. [5 marks]

d) For the circuit in Figure Q8, determine the:

i) a.c collector voltage. [8 marks]

ii) a.c output voltage across the load. [5 marks]

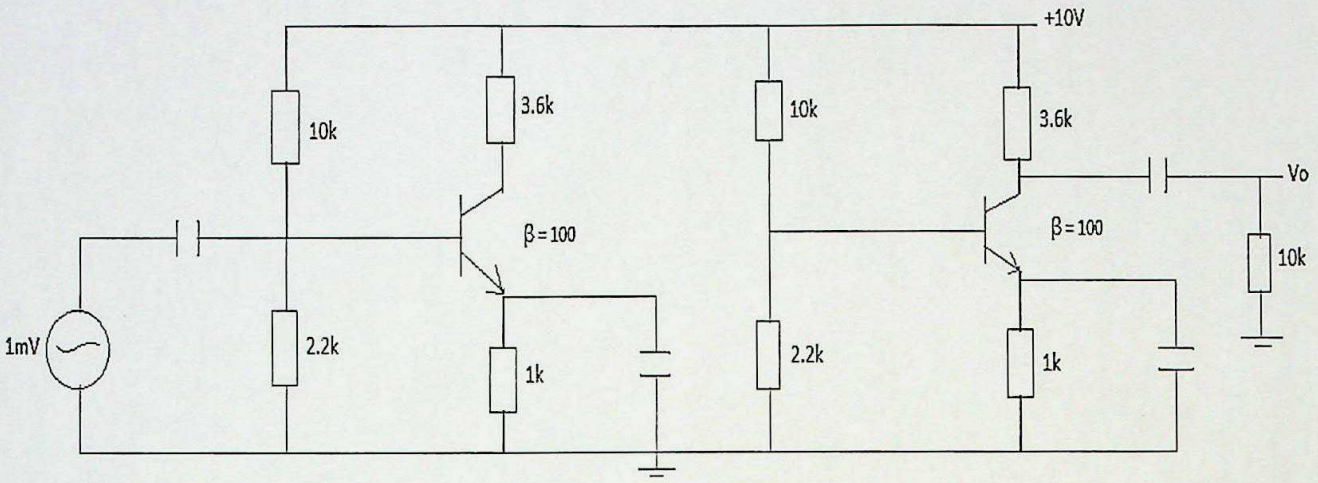


Figure Q8: Cascade amplifier

[TOTAL MARKS 20]