**SOUTH EASTERN KENYA UNIVERSITY**

**UNIVERSITY EXAMINATIONS 2016/2017**

**FIRST SEMESTER EXAMINATION FOR THE DEGREE OF**

**BACHELOR SCIENCE IN ELECTRONICS**

**ELC 302: TRANSISTORS**

**8TH DECEMBER, 2016**

**INSTRUCTIONS TO CANDIDATES**

**TIME: 8.00-10.00 A.M**

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This paper consists of **FIVE (5)** questions.

Answer question **ONE** and any other **TWO** questions.

Question **ONE** carries 30 marks while the other **TWO** questions carry 20 marks

each.

**QUESTION 1 (COMPULSORY) (30 MARKS)**

a) By using circuit symbols, distinguish between bipolar junction transistors (BJTs) and

unipolar junction transistors (UJTs)

(4marks)

b)

The diagram below shows a transistor circuit.

Given that VBE = 0.7 and β= 100, determine:

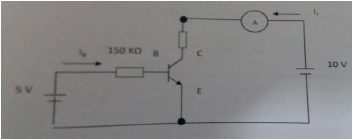
i.

IB, IC, and IE

(6marks)

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ii.

iii.

VCB

Plot schematic diagrams for the output characteristics

(2marks)

(4marks)

c) Name the three transistor configurations and draw simple circuit diagrams for each

(8marks)

d) Figure 2 below shows an inverting amplifier operated from a ±15 V supply.

i.

ii.

Calculate the voltage gain of the amplifier. (3marks)

A sinusoidal PD of 0.50 V RMS and frequency 1kHz is applied to the

input. Using the same axes showing suitable voltage and time scales,

sketch the variationwith time of the input PD and the output PD

(5marks)

e) Name different types of FET biasing .

(2marks)

**QUESTION TWO (20 MARKS)**

a) (i) Draw a well labelled circuit diagram that can be used to determine the input

characteristics for common emitter configuration of a transistor

(5marks)

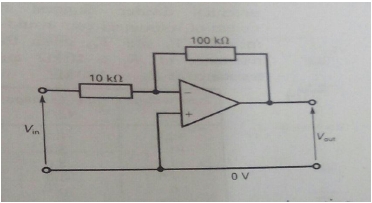
(ii) By using appropriate graphs, discuss the input characteristics for different values

of VCE for the circuit in (i) above stating any special features. (5marks)

b) In the circuit below the input resistor is varied between 1 kΩ and 10 kΩ.

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If the voltage Vbe is 2V and the current gain hfe = 100, calculate:

i.

ii.

iii.

iv.

The voltage across the input resistor Ri

The maximum and minimum currents through the base Ib

The minimum and maximum current Ic

The emitter current Ie when Ri = 5 kΩ

(2marks)

(2marks)

(2marks)

(4marks)

**QUESTION THREE (20 MARKS)**

a) The circuit diagram in figure 3 below shows how a transistor can be used to amplify

small voltage change.

i.Briefly explain how a small alternating PD applied at the input can be amplified

(5marks)

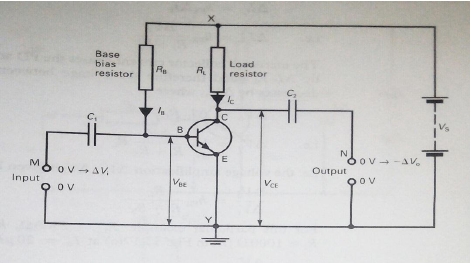
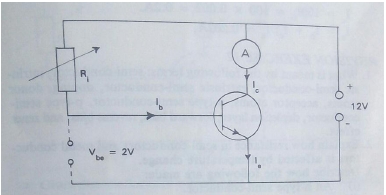
ii.

If the characteristics of the transistor are such that in the absence of an input

signal the steady collector current IC = 2 mA, the collector emitter voltage VCE

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= 4 V and the supply PD = 9V. Given that when collector current IC = 2 mA,

the base current IB = 20µA and at this current VBE = 0.8 V, calculate

I.

the value of the load resistor RL

(2marks)

II.

III.

IV.

the value of the biasing resistor RB

the voltage amplification

the power amplification

(2marks)

(5marks)

(2marks)

**b)** A JFET has parameters of VGS(off) = -40V, and IDSS = 15 mA. Calculate the drain current

in this resistor if the gate source voltage VGS = 12 V.

(4marks)

**QUESTION 4 (20 MARKS)**

**a)** Define the h – parameters for the common base and common collector transistor

configurations and compare them with the general parameters (10marks)

**b)** The circuit diagram below can act as a switching circuit.

By drawing a graph of the variation of Vo against Vi, Explain how the switching

mechanism is achieved.

(10marks)

**QUESTION 5 (20 MARKS)**

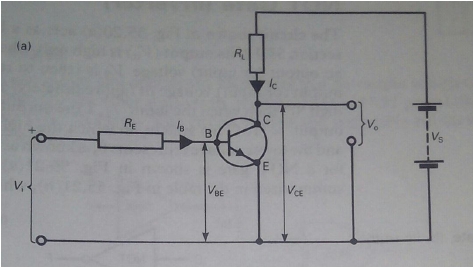
a) (i) Draw a circuit diagram for an amplifier as an astable multivibrator and sketch the

corresponding waveform of output voltage against time. (8marks)

(ii) Show that the period of the corresponding waveform is given by

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(6marks)

**b)** An amplifier having a gain of 500 without feedback has an overall negative feedback

applied which reduces the gain to 100

i.Calculate the fraction of the output voltage fed back

(3marks)

ii.

If due to the aging of components, the gain without feedback falls by 20%,

calculate the percentage fall in gain without feedback and with feedback

(3marks)

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*T* 2*CR* log *e*1

2*R*2

*R*1