TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONIC ENGINEERING

TEE 4202: ANALOGUE ELECTRONICS 1.

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2 HOURS

DATE: SEPTEMBER 2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Attempt any three questions.

Do not write on the question paper.

Question ONE

(a)(i).Differentiate between power rectification and power filtering.

(ii).State any two applications of DC power supplies. **(4 Marks).**

(b)(i).Explain why ripple voltages are not desired in power supplies. (ii). Using a π filter network, explain how the ripples may be reduced.

(iii).Draw a half wave controlled rectifier circuit and explain its operation. Assume a resistive load. **(11 Marks).**

(c).A full wave rectifier circuit uses a step down transformer of ratio 5:1.The rectifier serves a resistive load in parallel with a filter capacitor C. If the input voltage is Vs = 240V at 50 Hz, Determine,

(I).Average and Rms output voltage.

(II).Form Factor.

(III).Rms power delivered to the load. **(5 Marks).**

Question TWO

(a)(i).Differentiate between an N and P channel field effect transistors. (ii).State any two advantages of field effect transistor compared to bipolar transistors.

(iii). Relating to field effect transistor, explain the meaning and characteristic of the following regions.

(I).Pinch off. (II).Breakdown region.

(iii).Draw a single stage field effect transistor amplifier and explain its operation. **(8 Marks)**

(b)(i).Define hybrid parameters of a field effect transistor amplifier and state any two of its applications.

(ii).Using appropriate h-parameters, derive the voltage gain and current gain expressions for a field transistor amplifier.

(iii).A CE transistor amplifier has the following parameters hie=1.1kΩ, h_{re}= $2.5x10^{-4}$, h_{fe}=50 and h_{oe}=25 micro-mho. If the load resistance is 15 kΩ and source resistance is 1 kΩ, determine the circuit

(I).Current gain. (II).Voltage gain. **(12 Marks)**

Question THREE

(a)(i).Define an intrinsic semiconductor material and state its electrical properties under room temperature conditions.

(ii).Explain the meaning of the following terms as used in semiconductor physics.

(I).Donor atom (I).Band gap.

(ii).State any two types of diodes and state their applications. **(6 Marks).**

(b)(i).Explain the cause of thermal run away and how the effect may be avoided.

(ii).With the aid of a diagram, explain the construction of an NPN transistor. **(10 Marks)**

(c).A transistor circuit has the following data. Collector current, I_C =5.501mA, base current, I_{B-}= µA, I_{CO} = 5µA.Determine the following.

(I).The value current gain α. (II). The value current gain β and emitter current I_E. **(4 Marks)**

Question FOUR

(a)(i).Define negative feedback in amplifiers and state its significance in amplifier performance.

(ii).Name any two types of negative feedback that are used in amplifiers and state thier effect on input and output resistances. **(6Marks)**

(bi).Identify the circuit of Fig Q4 and explain its operation.

(ii).Derive the relationship between the input and output voltages of the circuit. **(8 Marks)**

(c) Acommon emitter amplifier has an input of 100µV and an output of 120mV associated with a noise signal of 12 µV before NFB is applied.After NFB application,the output signal falls by 40%.Determine,

(I).Feddback factor,β. (II).Voltage gain with feedback.(III).Output noise level after NFB application.

(ii).If the input of the amplifier has noise voltage 2μV,Calculate the output noise level when negative feedback is applied.

(6 Marks)

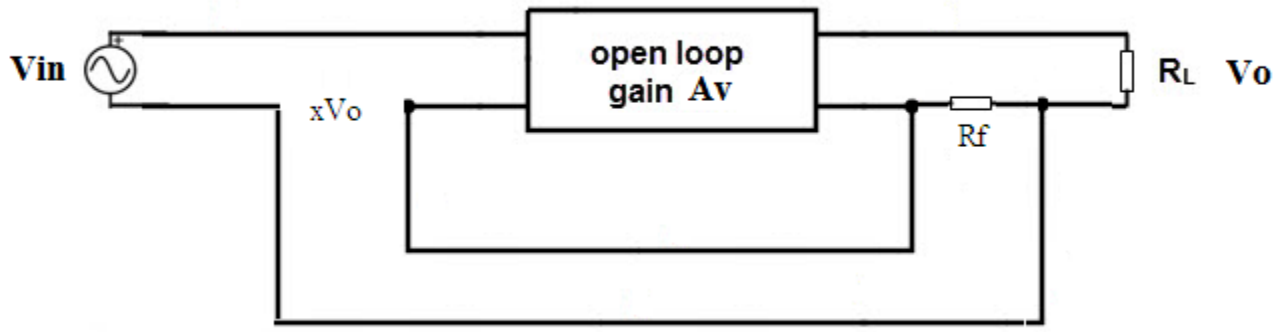

Fig Q 4

Question FIVE

(a) (i).Explain the meaning of transistor biasing and why it is necessary.

(ii).State the meaning of the following as used in transistor amplifiers

(I).Load Line. (II).Q – point. **(6 Marks).**

(b)(i). Identify the circuit of Fig Q5 (a) and explain its operation.

(ii).Explain the effect of leakage current in the operation of a transistor. **(10 Marks).**

(c).A transistor circuit is biased as shown in Fig Q5 (b). Determine, given β =100,

(i).Base current I_B (ii).Collector current I_C (iii).Emitter current I_E

(iv).Collector Emitter voltage, $V_{CE.}$ **(4 Marks).**

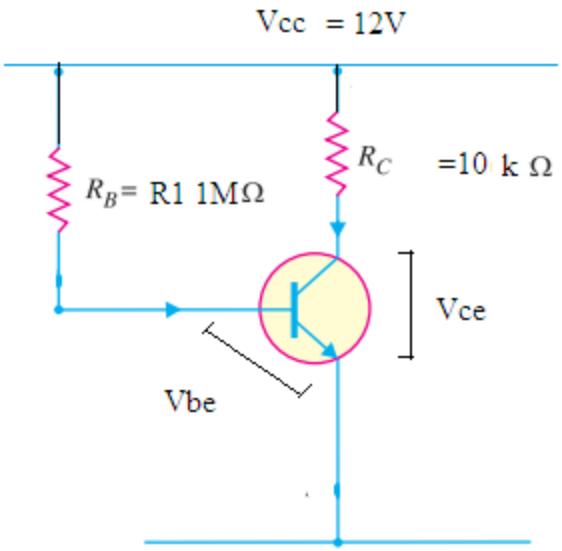

Fig Q5 (a)

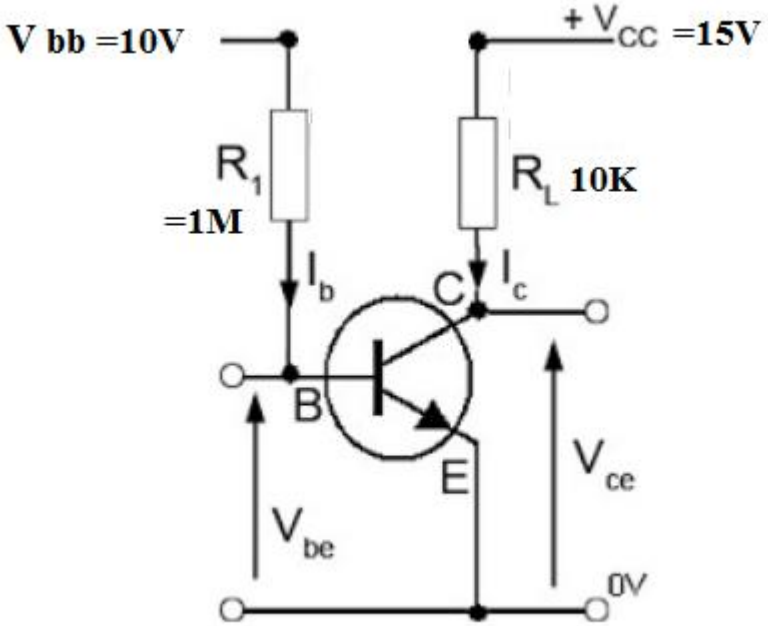

Fig Q 5 (b)