TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MEDICAL ENGINEERING

EEE 4231: ANALOGUE ELECTRONICS 1.

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: DECEMBER 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Question ONE is Compulsory attempt any other TWO questions.

Do not write on the question paper.

Question ONE

(a) (i).Define the following terms as used in semiconductor physics.

(I).Valency bond. (I).Extrinsic semiconductor.

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

(b) (i).Explain the effect of temperature on semiconductor conductivity.

(ii).With the aid of a diagram, explain the construction of a PN junction diode.

(iii).With the aid of a diagram, explain the determination of a diode VI characteristics.

(c).Figure Q1 shows a zener diode circuit supplying a variable load. Determine the load and zener diode currents when the load is varied between the two limits. **(3 Marks).**

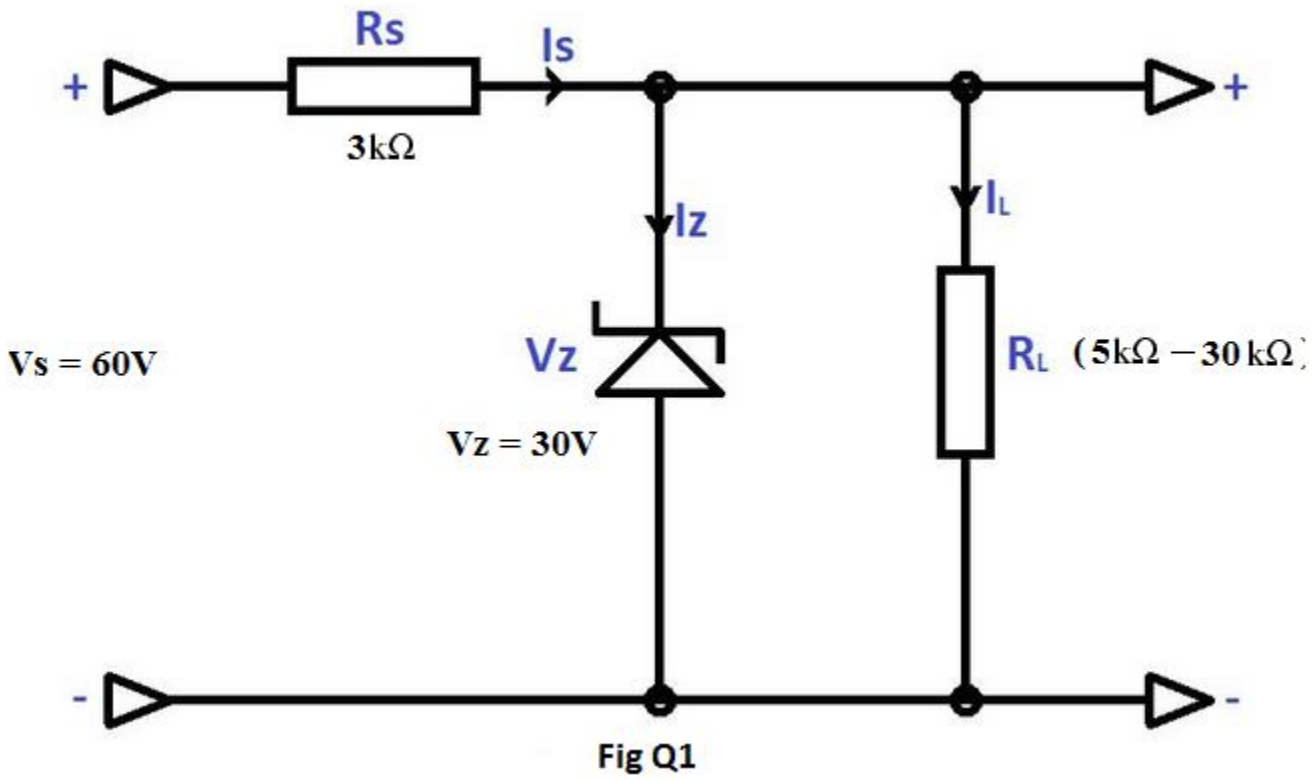

Fig Q1

Question TWO

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

(ii).State any two applications of DC power supplies. **(3 Marks).**

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

(ii).Draw a full wave rectifier circuit using a center tapped transformer and explain its operation. Assume a resistive load. **(12 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).The rms power delivered to the load. **(4 Marks).**

Question THREE

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

(I).Q – point. (II).Signal Distortion.

(ii).Explain the need for proper transistor biasing circuit. **(6 Marks).**

(b) (i). Explain the effect of leakage currents on a transistor amplifier.

(ii).Draw a common base transistor and determine its output characteristics. **(10 Marks).**

(c).A transistor circuit is biased as shown in Figure Q3. Given β =100, Determine,

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

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

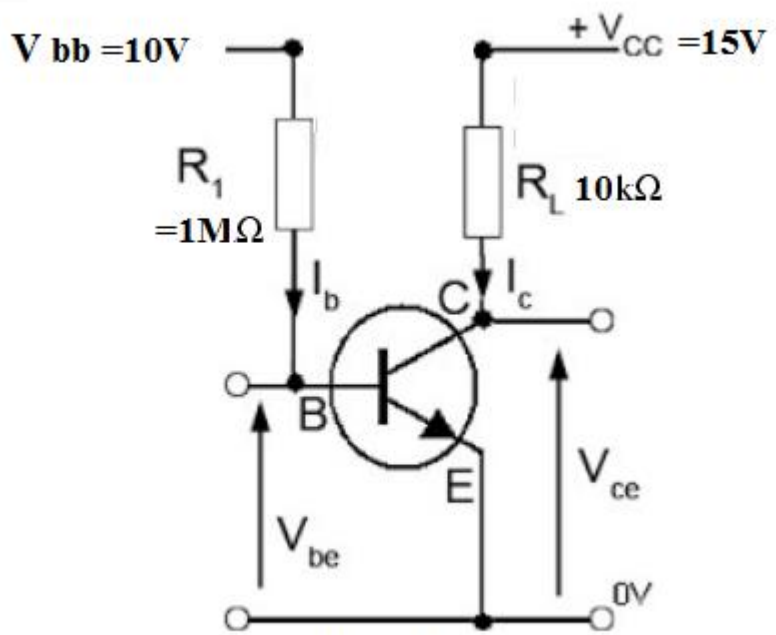

Fig Q3

Question FOUR

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

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

(b) (i).Identify the circuit of figure Q4(a) and explain its operation.

(ii).Derive the relationship between the input and output voltages of the circuit. **(9Marks)**

(c).For the circuit of Figure Q4(b). Given C_{IN} =1µF,C_{OUT} =10 µF,R_1 =120K,R_2 =33 Kilo ohm and R_4 =1 Kilo ohm calculate,

(I).Voltage gain without feedback. (II).Feddback factor,β. (III).Voltage gain with feedback.

(5 Marks)

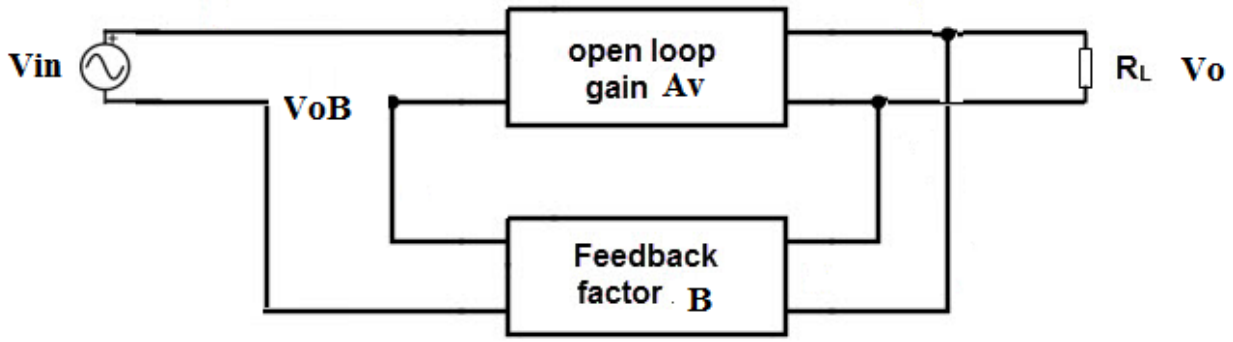

Figure Q 4a

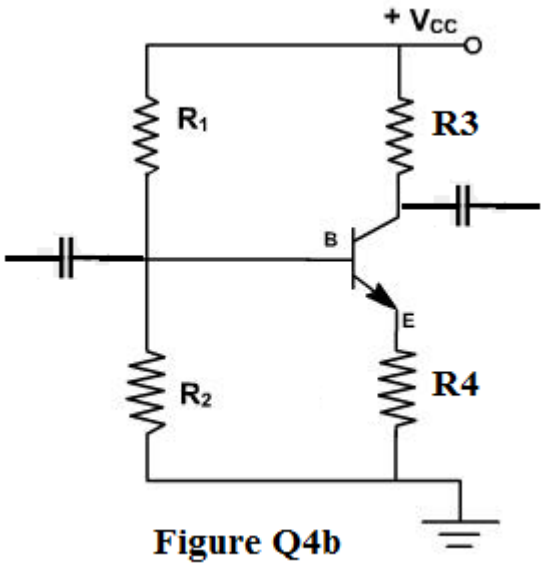

Figure Q4b

Question FIVE

(a) (i). Differentiate between leakage currents I_{CBO} and $I_{EBO.}$

(ii).Name any two types of transistor biasing. **(4Marks).**

(b) (i).Draw a two port active model of a transistor and define any two of its

(ii).State the significance of h-parameters of a transistor amplifier.

(iii).From the two port model, derive the expression for following using h-parameters.

(I).Current Gain, A_i. (II).Input resistance. **(13Marks).**

(c).A transistor amplifier connected in a common base configuration has the following parameters.

h_{ib} = 21.6, h_{rb} = 2.5 x 10^{-4}, h_{fb} = 0.98 and h_{ob} = 0.5µMho. If the amplifier is connected to a load of 10 Kilo ohm and the power source has an impedance of 2 Kilo ohm, determine,

(I).Amplifier current Gain. (II). Amplifier input resistance. **(3Marks).**