TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MEDICAL ENGINEERING

EEE 4234: ANALOGUE ELECTRONICS II.

END OF SEMESTER EXAMINATION

SERIES: JUNE 2017

TIME: 2 HOURS

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).Distinguish between distortion and noise in electronic circuits.

(ii).Explain how noise is generated in a diode and how it can be minimized.

(iii).A diode carries a current of 2mA and the signal bandwidth is 100 kHz, calculate the diode shot noise.

(10 Marks)

(b) (i).Define multi stage amplification, hence explain the operation of direct inter stage amplifier coupling.

(ii).Explain where and how direct inter stage amplifier coupling is employed.

(iii). A transformer coupled amplifier operates from a DC power supply of 25 and draws a current of 6 amps. If the transformer has a turns ratio of $N_P/N_S = 5$ and couples the collector to a load of 40Ω, determine,

(I).Whether the amplifier is matched to the load resistance.

(II).The maximum AC output signal power.

(III).The maximum input DC power. **(10 Marks)**

(c)(i).State any two amplifier classes and describe their differences.

(ii).Explain why class C amplifiers cannot be used as audio amplifiers.

(ii).The signal input to small signal amplifier consists of 50µW of signal power and 0.5 µW of noise power. The amplifier generates an internal noise power of 50 µW and has a gain of 20dB. Determine,

(I).Input signal to noise ratio.

(II). Output signal to noise ratio.

(III).Noise factor

(IV).Noise figure. **(10 Marks)**

Question TWO

(a) (i).Distinguish between noise power and useful power as generated by semiconductor components.

(ii).Explain how the following types of noise is generated.

(I).White noise (II).Shot noise

(iii).Explain how noise interference may be reduced in communication systems. **(10 Marks)**

(b)(i).Name any two sources of external noise.

(ii). Explain how temperature change may cause noise in transistors.

(ii).Describe how thermal agitation noise occur in semiconductor devices.

(iii).Three resistors of 10 kΩ, 22 kΩ and 15 kΩ are connected in series. If the environmental temperature is 20 degrees, calculate the generated noise voltage and power. **(10 Marks)**

Question THREE

(a) (i).Define amplifier coupling. With the aid sketches, distinguish between impedance and direct coupling.

(ii)State any two advantages of impedance coupling compared to direct coupling.

(ii).Using simple sketches, explain the difference between transformer coupling and resistance-capacitance coupling. **(8 Marks)**

(b).FIG Q3 shows a two stage amplifier.

(i).Draw it's the first stage AC equivalent circuit.

(ii).Derive the first stage voltage gain in terms of input and output resistance.

(iii).Calculate the circuit first and second voltage gain values.

(iv).Express the overall voltage gain in decibels. **(12 Marks).**

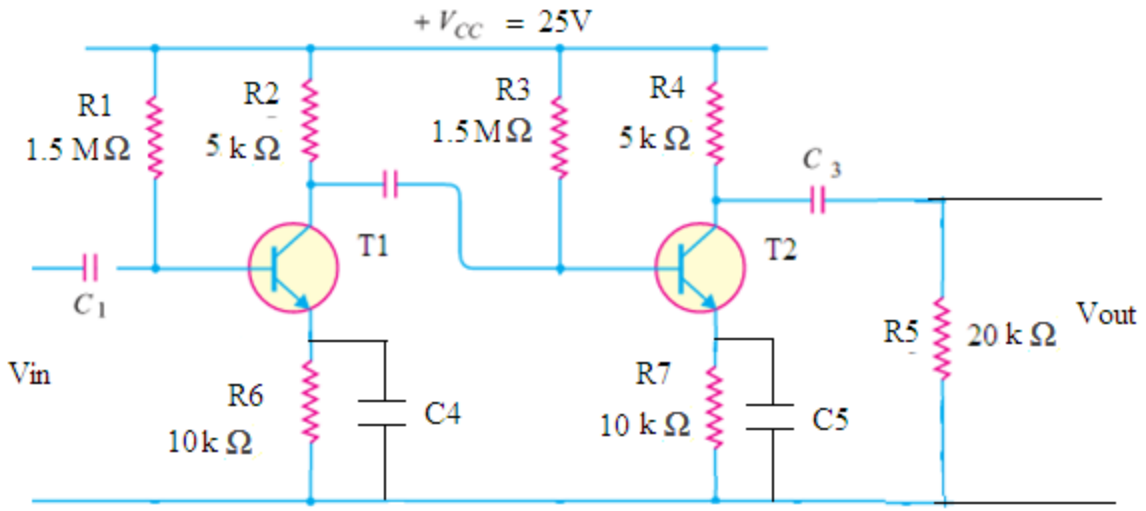

FIG Q 3

Question FOUR

(a) (i).Using values of your own choice as an example, explain how a load line of an amplifier can be constructed.
(ii)Explain the application of the following parameters in amplifier circuit.

(I). Active region (II).Quiescent point.

(iii).Explain the factors that may cause drift of the transistor quiescent point. **(6 Marks)**

(b)(i).Explain the bias conditions required so that a maximum un-distorted signal may be achieved.

(ii).The circuit of FIG Q4one form of transistor biasing.

(I).Determine and draw its dc load line.

(I).Calculate and locate the exact position of the Q-Point on the load line.

(II).Calculate the stability factor of the circuit. **(8 Marks)**

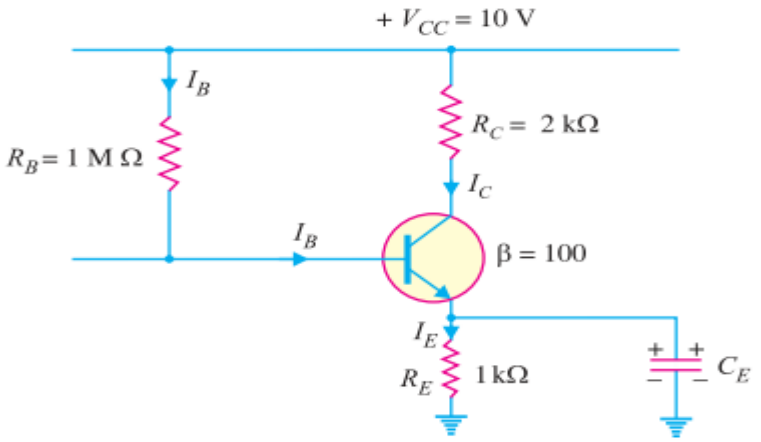

FIG Q4

Question FIVE

(a) (i).Differentiate between small signal and large signal amplifiers. Name the classes of amplifiers that can be used in such amplifiers.

(ii).Explain the difference between the powers associated with amplifiers and how such powers can be adjusted to improve efficiency.

(iii).By using load line sketches, explain the distinction between class B and class C amplifiers**. (8 Marks)**

(b) (i).Differentiate between AC and DC load lines as used with signal amplifiers.

(ii).Describe using a load line how signal clipping may occur in amplifiers.

(iii).The circuit of FIG Q5 is an audio amplifier. If the peak to peak output signal is 18V and the input impedance of the base is 100Ω, calculate the power gain of the circuit. **(12 Marks)**

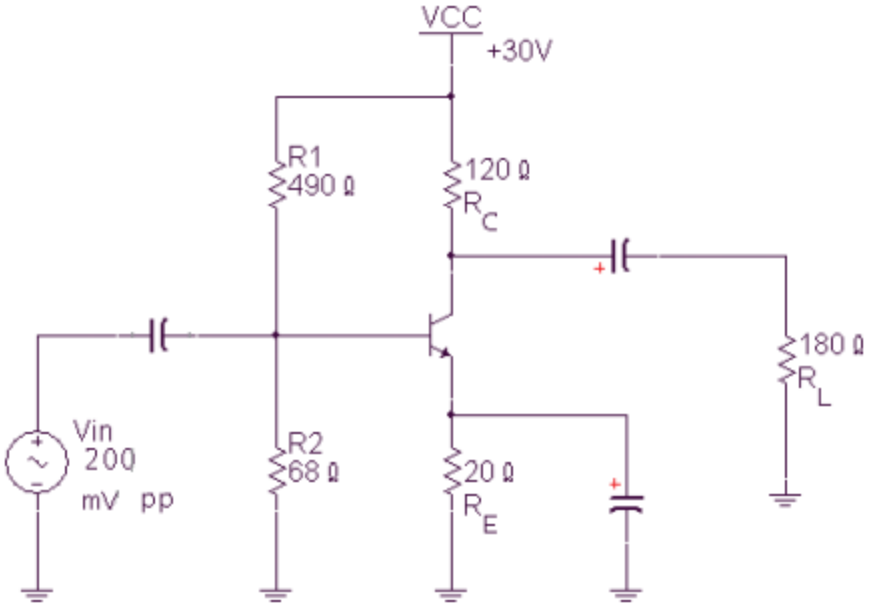

FIG Q5