Course: BTEC L3 Extended Diploma in Engineering / Diploma in Electrical / Electronic Engineering

Unit/s: 57: Principles and Applications of Analogue Electronics

Outcome/s: 1 Types of Amplifier

Grading criteria:
- P2 Describe two different classes of amplifier
- P3 Explain four different effects of feedback on the function of an amplifier
- M1 Compare the practical performance of two different classes of amplifier

Pass: 

Merit: 

Distinction: 

Instructions:
- attempt all questions
- work to be legible and succinct, with an adequate grasp of grammar, punctuation and spelling
- calculators may be used but show working step by step
- ensure sketches & diagrams are clear, accurate & labelled
- true graphs, titled & axes labelled
- list sources where appropriate.

Student feedback:

Student declaration – The assignment attached is my own work
Signed: 
Date:

Assessor feedback:

Signed: 
Date:

Internal verification
(Before issue) 
Issue date 
Student hand in date 
Internal verification 
(assessment decision) 

RP 5/3/13
Grading Criteria and Feedback

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Assignment – Types of Amplifier

Using your class notes and any other suitable resources, attempt the following tasks. Show all of your workings and draw supporting circuit diagrams.

This practical and written assignment provides evidence for satisfaction of the Learning Outcomes P2 and P3, and the opportunity to achieve M1. (The relevant grading criteria are given in brackets after each task)

1 Effect of feedback

Explain the effect of feedback on the following functions of an amplifier:

a) Gain
b) Bandwidth
c) Input and output impedance
d) Noise and distortion.

(P3)

2 Classes of Amplifier

Describe the main characteristics of a Class AB and Class B transistor amplifiers. Use suitable waveform sketches to support your answer. You should include in your submission reference to transistor conduction angles, amplifier efficiency, and output distortion.

(P2)

3 Class B Push-Pull Amplifier Practical

Method

a) Build / simulate the amplifier circuit shown in figure 1.
b) Connect a signal generator and adjust to give a sine wave \( V_{in} \) of \( 3V_{pk-pk} \) at 1 kHz.
c) Monitor \( V_{in} \) and \( V_{out} \) with an oscilloscope and sketch these on a common timescale.
d) Observe the output signal for values of \( V_{in} \) of 0.6V, 1V, 1.5V, 2V, 5V and 8V.
e) Draw a sketch of \( V_{in} \) and \( V_{out} \) when \( V_{in} = 1.5V \).
f) Disconnect the signal generator and measure the current flow in the transistors \( (I_c) \).
Results

a) Explain why there is no output for low amplitude input signals.

b) When $V_{in} = 1.5V$ are both the positive and negative output half cycles the same amplitude? - Justify your findings.

c) What is the quiescent current flowing in the output transistors?

![Class B Transistor Amplifier](image)

Figure 1 - Class B Transistor Amplifier

(M1 part)

4 Class AB Push-Pull Amplifier Practical

Method

a) Build / simulate the amplifier circuit shown in figure 2.

b) Connect a signal generator and adjust to give a sine wave $V_{in}$ of $2V_{pk-pk}$ at 1 kHz.

c) Monitor $V_{in}$ and $V_{out}$ with an oscilloscope and sketch these on a common timescale.

d) Observing the output carefully, carry out the following:
   i. Short circuit D1 (bridge D1 with a piece of wire)
   ii. Short circuit D2
   iii. Short circuit D1 and D2
   iv. Restore diodes to their original state

e) Disconnect $V_{in}$ and measure the current ($I_c$) flowing in the transistors.
Results

a) Explain the purpose of D1 and D2?

b) What is the quiescent current flowing in this circuit and how does it compare with the results found in Class B circuit in task 3.

c) What is the voltage gain of this amplifier?

d) Comment on the actual biasing of the transistors in this circuit.

Figure 2 - Class AB Transistor Amplifier

(M1 part)