Teaching ideas for Option F, *Communications*

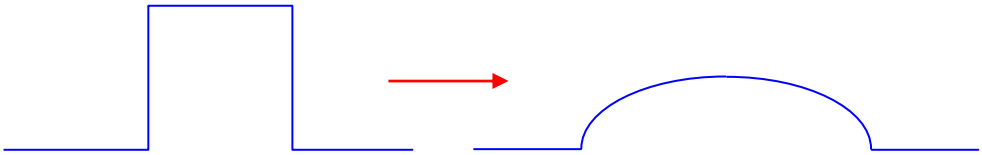
Questions

A number of worksheets are provided for this Option:

- support questions examine the very basic concepts of the syllabus
- extended questions delve deeper and are equivalent to exam level questions.

Teaching ideas

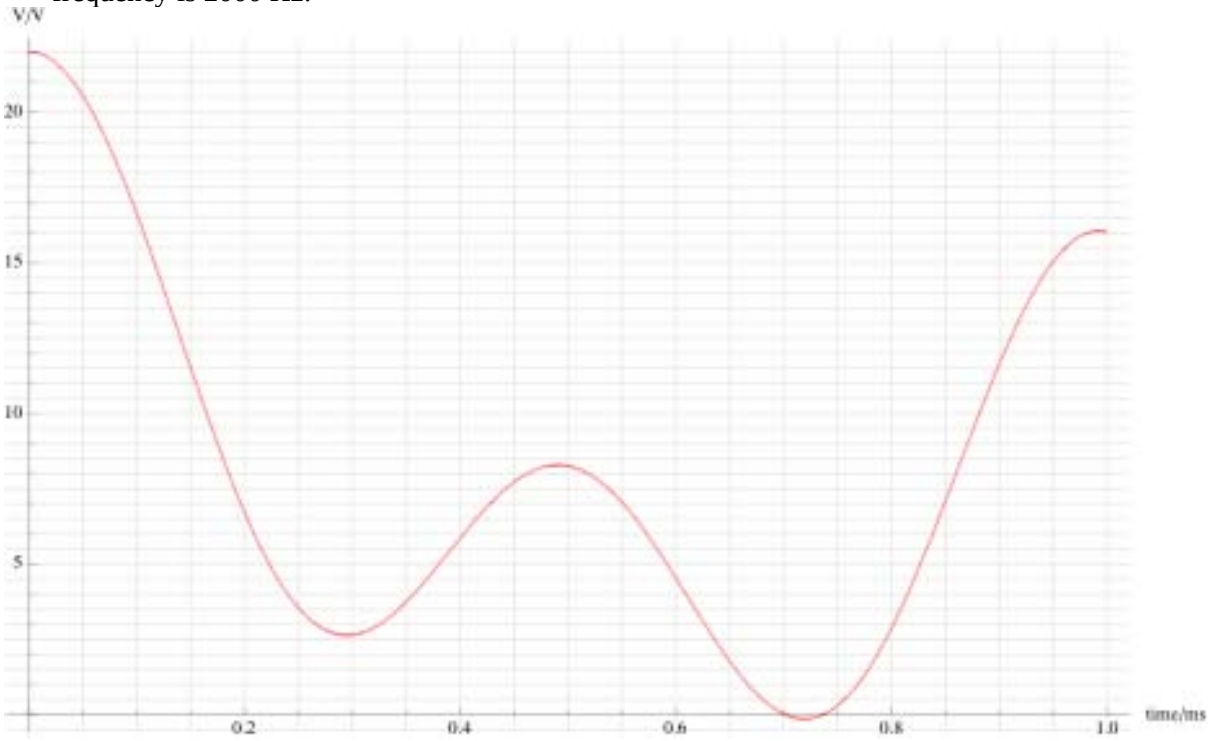
- In describing AM students must not forget to say that the carrier frequency stays constant and in describing FM it is the amplitude of the carrier that stays constant.
- It is a worthwhile exercise to ask students to write down as many digital and as many analogue signals they can think of.
- It is important to explain the broadening of a signal in terms of dispersion and to explain why this puts a limit on the frequencies that can be carried. The main idea is that a broadened signal such as



does not have sharply defined edges so it becomes difficult to see when it starts and when it ends.
- The operational amplifier is always a bit of a mystery, especially in those cases where no experimental work related to the op-amp takes place. Past exam questions can be used to illustrate some of the points behind the workings of the op-amp. A simple simulation of the op-amp can be found here: http://www.indiabix.com/electronics-circuits/op-amp/
- The same applies to the Schmitt trigger. At the same site as the above, you will find a decent Schmitt trigger simulator: http://www.indiabix.com/electronics-circuits/schmitt-trigger-with-op-amps/
- Students must understand that the reason infrared radiation is being used in optical fibre transmissions is because attenuation is heavily frequency dependent and is least for infrared wavelengths.
- The section on mobile phones is very short and limited in its content. The best preparation for it is to look for past exam questions.

Practical activities/ICT

- It is a useful exercise to give to students some sort of signal, whose highest frequency component you know, and then ask for samples to be taken. Different groups in the class can work different sampling frequencies, starting with very low and moving to above the Nyquist frequency. The different groups can then discuss which set of samples best approximates the original signal. An example of a signal that can be used is the following, whose highest frequency is 2000 Hz.



Common problems

- Students often confuse the two types of dispersion in an optic fibre and those who know there are two types cannot explain the difference between them.
- Op-amp problems are very badly done in exams and need attention.

Theory of knowledge (TOK)

- The emergence of the digital world has made vast amounts of information available to anyone with internet access. Apart from the moral and ethical issues this raises, it also raises issues about *how* we learn and how reliable the information we receive actually is. This access to information has enormous liberating advantages, but it also has drawbacks.