2001 HIGHER SCHOOL CERTIFICATE EXAMINATION

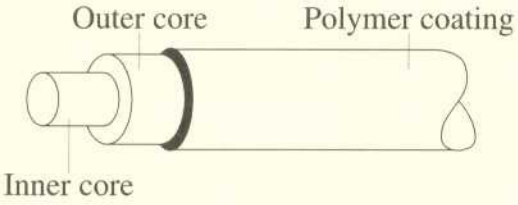
Engineering Studies

Section II (continued)

Marks

Question 16 — Telecommunication (15 marks)

(a) The diagram shows a section of fibre-optical cable which consists of two similar materials forming the inner and outer cores, and a polymer coating. **3**



Explain how fibre-optical cable transmits data, and why fibre-optical cable has replaced copper for this use.

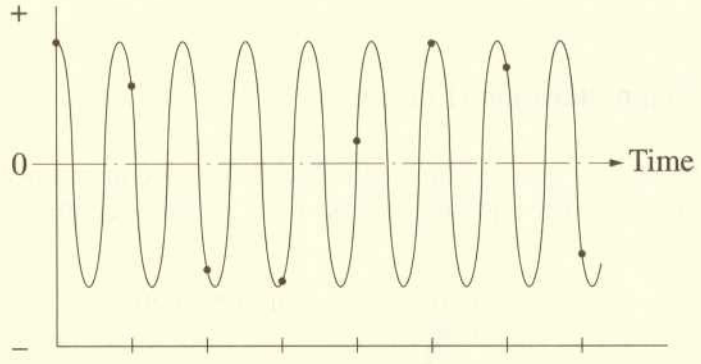
fibre optic cable transmit data by pulses of light that is totally internally reflected in the core and bas data digitised in it. The information, as light pulses travels at the speed of light and compared to copper cables that transmit electrical current, there is less energy loss and faster transmitter. Fibre optics doesn't produce electrical spark, are easier to install (cheaper as well) and repeaters can be spaced further apart due to the less loss in the signal. There is also no interference by electric or magnetic field associated with copper cables.

Question 16 continues on page 24

Marks

Question 16 (continued)

(b) An analogue signal is shown on the diagram. This signal is passed through an analogue-to-digital converter, sampling at the rate indicated. The resulting digital signal is indicated on the diagram as dots on the analogue signal. **5**



Sampling rate

Explain how the analogue signal is converted to a digital signal, and discuss the importance of the sampling rate during this conversion process.

The analogue signal which is a varying signal is transformed into an on and off signal by a converter. Information is fed in and wherever there is a +ve signal it is on on, wherever it is a –ve signal it is on off. Increasing the sampling rate provide a more informative signal and more detail can be converted.

Faster sampling rate means more accurate representation of the analogue signal as every bit of information adds to the whole digital signal.
digital signal is either a "1 or 0" or and "on or off" while analogue signal is a varying parameter.

Question 16 continues on page 25

Marks

Question 16 (continued)

(c) (i) Discuss the health and safety issues associated with the use of a telecommunications device that you have studied, and outline an effective strategy that may be used to overcome these issues. **4**

The mobile phones have been a cause of concern due to the utilization of radio waves that is found in the electro-magnetic sectrum. Since it is a type of radiation, which have been concerned about the damage it can do to cells and the ability of the high energy radiation to cause cancer in the body.

An effective strategy has been to do more research on the area and use a hands free while talking so that the radiation is not directed at the head. A weaker radiation, ie: smaller frequency might also reduce the harmful effects.

(ii) The introduction of modern telecommunications devices has resulted in much debate in our society concerning legal and ethical issues. Discuss TWO such issues. **3**

There is the problem of privacy as the misuse of mobile phone users means more intrusion to people personal lives. People can be contacted when they want to be left alone which causes an ethical problem.

Also radio and satellite communication means that information are constantly travelling in the air and can be intercepted by rivalling parties. Example is the transmission of details to a new variant, they can be intercepted and picked up by competing companies which becomes a legal problem as to who's idea it was in the first place.

End of Question 16