2003 HIGHER SCHOOL CERTIFICATE EXAMINATION

Engineering Studies

Section II (continued)

Marks

Question 16 — Telecommunication (15 marks)

(a) (i) The telecommunications industry uses copper and fibre optics for transmission of data. State a different application for each of these materials, and explain, in terms of their properties, why they are used for this application. **4**

Copper wires are used extensively for telephone connections to the speaker and microphone in phones. This is because copper conducts electricity as it is metallic and this is necessary in order for the microphone to induce a current, and the speaker to operate to enable phone calls. Phone calls are transferred by varying frequency current and amplitude, & hence copper is needed to allow electrical signals to flow. Copper is a good conductor & cane used. For some modems optical fibre is used. Computers are digital and hence the digital information can be transfered in optical fibre in pulses of light. It is used because it is very fast, due to light being used, and has a high bit rate which is excellent for high speed internet connections using some modems. Optic fibre is small, cheap and lightweight which makes it suitable for this use.

(ii) Cold drawing is used to form copper into electrical wire. Describe TWO problems associated with the use of the process. Describe a subsequent process that will reduce these problems. **3**

Cold drawing leaves the wire highly stressed and hence it is more brittle which may cause it to snap and lose electrical connection. ~~The~~ Cold drawing also work hardens the copper and can cause it to become stiffer and harder to ~~be~~ bend, which is a necessary property for wires, since they need to transport electricity. Annealing could be a subsequent process to reduce these problems. The wire would be heated ~~to~~ above recrystallisation temp. and slow cooled in a furnace. ~~or~~ This would create equiaxed grains and alleviate stress from the work hardening by cold drawing. ~~resulting~~ in

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Marks

Question 16 (continued)

(b) Identify TWO technological changes in the telecommunications industry. Discuss the effects that these changes have had on society. **4**

the development of satellite technology. This has allowed society to have 'live' coverage of events as well as allowing rapid communication over vast distances such as international phone calls. It has also led to GPS systems which enables us to precisely locate us and has helped in the search and rescue of many members of society as well as defence. Mobile phones is another technological change. It has allowed society to communicate from locations away from a land line. This has benefited businesses who can now be reached by customers regardless of their location. However, it has also had a negative impact in that the expense that some people can't afford as well as SMS addiction. It has also benefitted us by safety, as people can call for help from many remote locations.

(c) (i) Describe the transmission of data from a mobile phone to another mobile phone. **2**

modulated

The mobile phone sends ^ microwaves to a mobile phone tower. This tower is connected to a mobile phone grid and the data is transfered along this grid to the mobile tower within the other phones 'cell'. It is then transmitted by microwaves to the mobile phone. A different frequency is used to transmit and receive data, this is known as duplex signalling

(ii) Explain the effect that mobile phone communications may have on other electronic systems. State TWO situations where this effect could endanger lives. **2**

electrical

The microwave radiation may cause ^ interference with other electronic systems. This could endanger lives in hospitals where life saving equipment could be affected, hurting the patient. Also in aircraft where they may cause electronic interference in flight equipment which could cause a crash.

End of Question 16