2003 HIGHER SCHOOL CERTIFICATE EXAMINATION

Engineering Studies

Section II (continued)

Marks

Question 13 — Personal and Public Transport (10 marks)

A railway track has rails made of 0.8% carbon steel.

(a) The surface of the rails has been induction heated and water quenched. Describe the final structure and properties of the rail. **3**

the track would be tough - heated by Running electricity through it & then quenched in water this gives it a tough hard surface without being Brittle. it is capable of conducting electricity.

(b) A suburban train weighing 400 tonnes has to climb a gradient of 1 in 50 at a constant velocity of 60 km per hour. **3**

If the power required to overcome rolling resistance at this velocity is 450 kW, calculate the overall power needed to climb the gradient.

450 x 50
= 22500

Power = 22500 KW

Question 13 continues on page 16

Marks

Question 13 (continued)

(c) (i) Describe how an electric motor is used to convert electricity into rotary motion. **2**

$T = nBIl \sin\theta$ T = torque n = number of turns
B = magnetic intensity I = current l = length of wire.
Current goes through the wire & Reacts with the magnets to create torque or rotary motion.

(ii) Describe TWO different applications of electrical motors that are used in transport systems. **2**

* Starter motors - electric current is used to start cars by turning the fly wheel
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End of Question 13