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   **3**
the final structure and properties of the rail.

The final structure of the rails would have a slightly rough surface to provide friction against the runners on the train. The properties of the rail would change to a tough hardened material, low resistivity and good thermal conductivity.

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

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

$$P = \frac{W}{t}$$
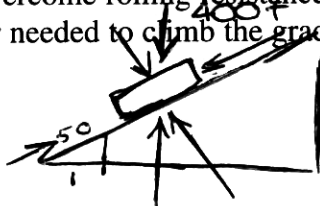
Power = ...

Question 13 (continued)

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

Electricity is converted into rotary
motion through a series of ~~today~~
~~adder~~ electrical impulses, converting
to mechanical energy producing
electricity creating movement.

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

There are series motor being DC
electric systems and AC electric system.
Applications used in transport systems
are turn conventional wheels producing
movement and create electric signals
across linking boundaries in a motor.
Used in trains and cars.

End of Question 13