

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 steel would be structure  
 would be martensite   
 • steel would be - Hard: very  
 scratch resistant  
 and brittle

- (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 kW

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

Power = ..... 7500 kW

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## Question 13 (continued)

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

An electro motive force is put in a coil of wire this wire is in a magnetic field. When there is a voltage carrying loop in a magnetic field a torque is induced this torque turns the coil.

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

- Used to spin <sup>or move</sup> something that transports people  
eg. Elevator, Lift
- Can be used in smaller motor vehicles to replace a petrol motor  
eg. Golf Buggies

End of Question 13