

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

The photograph below shows a coffee machine. The coffee machine uses an electric element to heat water.



- (a) The coffee machine has a metal case.

Why would it be dangerous for the live wire of the electric cable to touch the metal case?

(1)

- (b) The power output of the coffee machine is 2.53 kW.

The mains potential difference is 230 V.

Calculate the current in the coffee machine.

Current = _____ A

(3)

- (c) The coffee machine heats water from 20 °C to 90 °C.

The power output of the coffee machine is 2.53 kW.

The specific heat capacity of water is 4200 J/kg °C.

Calculate the mass of water that the coffee machine can heat in 14 seconds.

Mass = _____ kg

(5)

(Total 9 marks)

Q2.

The diagram below shows a wind turbine.



- (a) At a particular wind speed, a volume of $2.3 \times 10^4 \text{ m}^3$ of air passes the blades each second.

The density of air is 1.2 kg/m^3 .

Calculate the mass of air passing the blades per second.

Mass of air per second = _____ kg

(3)

- (b) The power output of the turbine is directly proportional to the kinetic energy of the air passing the blades each second.

Describe the effect on the power output when the wind speed is halved.

(3)

- (c) At a different wind speed, the wind turbine has a power output of 388 kW.

The mass of air passing the wind turbine each second is 13 800 kg.

Calculate the speed of the air passing the blades each second.

Assume that the process is 100% efficient.

Speed of air = _____ m/s

(3)

(Total 9 marks)