

2001 HIGHER SCHOOL CERTIFICATE EXAMINATION

Physics

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Centre Number

Section I – Part B (continued)

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Student Number

Marks

Question 21 (3 marks)

A fan that ventilates an underground mine is run by a very large d.c. electric motor. This motor is connected in series with a variable resistor to protect the windings in the coil.

3

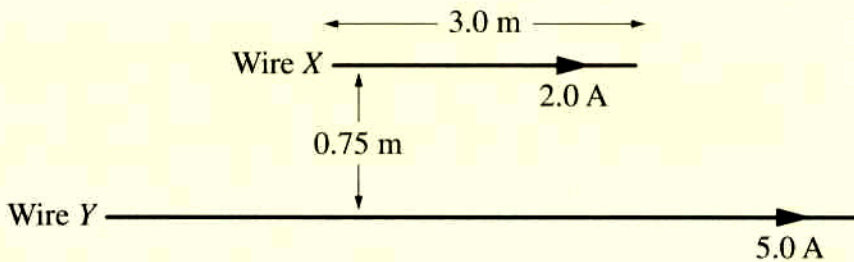
When the motor is starting up, the variable resistor is adjusted to have a large resistance. The resistance is then lowered slowly as the motor increases to its operating speed.

Explain why no resistance is required when the motor is running at high speed, but a substantial resistance is needed when the motor is starting up.

The resistance occurred at the start in due to back emf caused by Lenz's law. As the motor is starting up, the resistor is doing the opposite. But as the motor reaches it's speed the opposing force no longer exists.

Question 22 (7 marks)

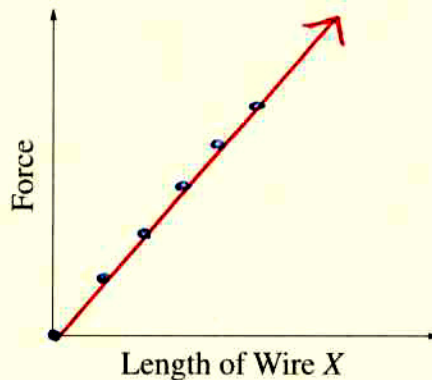
Two parallel wires are separated by a distance of 0.75 m. Wire X is 3.0 m long and carries a current of 2.0 A. Wire Y can be considered to be infinitely long and carries a current of 5.0 A. Both currents flow in the same direction along the wires.



- (a) What is the direction of the force that exists between the two wires? 1

The force is of ~~repulsion~~ attraction

- (b) On the axes, sketch a graph that shows how the force between the two wires would vary if the length of Wire X was increased. 2



- (c) In your Physics course you have performed a first-hand investigation to demonstrate the motor effect. Explain how your results demonstrated that effect. 4

A ~~moving~~ rotating coil in a magnetic field will experience a torque, which is the turning force. When a coil of wire was placed in a magnetic field and current ran through, it was observed that the coil began to rotate, due to the force acting on the sides of the coil. This force was the motor effect and could be calculated by $T = BIAN \cos \theta$

Marks

Question 23 (6 marks)

Discuss the effects of the development of electrical ^{generators electricity} generators on society and the environment.

6

Development of generators has impacted on society... making ~~lifestyle~~ ^{use of} more highly mechanised and electronic systems. The production of electric lights means longer working hours. Yet the labour force and its skills are being reduced as humans are being replaced by operating machinery. A negative effect of electrical generators, is in power stations mostly fossil fuels are used to generate electricity which create thermal pollution, acid rain, and adds to the greenhouse effect. On the other hand generators have provided ~~many~~ electricity for many things which we use today such as household appliances for example toasters and rice cookers.