

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

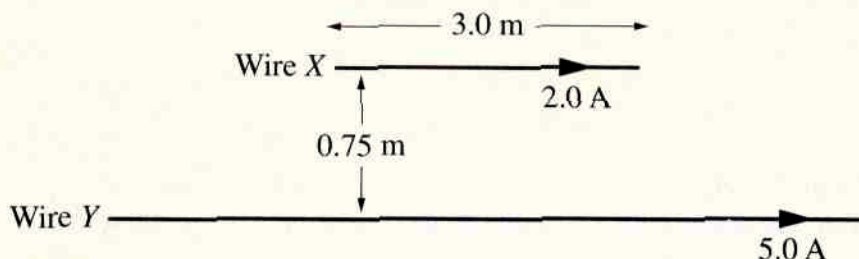
When the motor is starting up, the variable resistor is adjusted to have a large resistance. The resistance is then lowered slowly as the motor increases to its operating speed.

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.

When the motor is starting their resistance is needed so not to blow the circuit but @ high speed the Back EMF in the motor provides the necessary resistance when the fan is @ high speed.

Question 22 (7 marks)

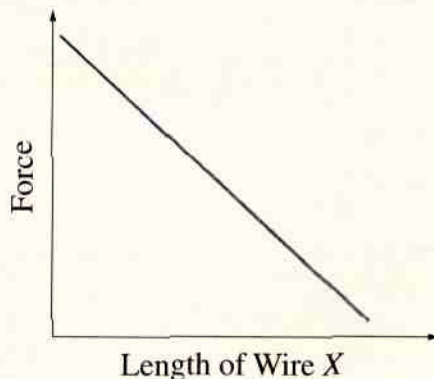
Two parallel wires are separated by a distance of 0.75 m. Wire X is 3.0 m long and carries a current of 2.0 A. Wire Y can be considered to be infinitely long and carries a current of 5.0 A. Both currents flow in the same direction along the wires.



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

~~The direction of the force is down.~~
 The direction of force will be towards each other.

- (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

The motor effect shows that the current carrying conductor in the presence of an electric field experiences a force. ~~For~~ we constructed 2 ~~the circuits~~ circuits attached to 2 power boxes, and the wires from each circuit were placed close side each other. When the currents of the two were in the same direction, they experienced a force of attraction, and in the opposite direction, experienced a force of repulsion.

Question 23 (6 marks)

Discuss the effects of the development of electrical generators on society and the environment.

6

Electrical generators ^{were} ~~were~~ popularized during the era of the industrial revolution, through people such as Nikola Tesla and Thomas Edison. - Thomas Edison's incandescent lightbulb emphasized the notion of domestic electricity. This implication on society as well as the industrial revolution in which generators were widely used, induced the demand for labour skills and manufacturing firms. This may have placed stress on the environment as the generators that society used were fuelled by coal, oil and other sources of nature that were generally non-renewable resources.