

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)

3

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.

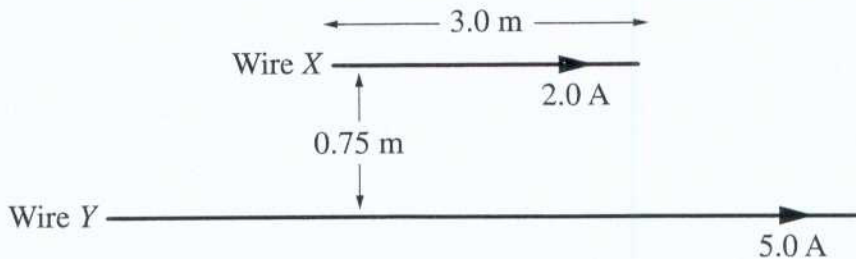
When the motor is starting up, the variable resistor is adjusted to have a large resistance. The resistance is then lowered slowly as the motor increases to its operating speed.

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 running at high speeds a back EMF is induced in the motor which resists the motion & in turn keeps the motor at a constant speed and ~~that~~ keeps the current in the wire to safe levels. When the motor is being started there is only a very small back emf so the current in the motor is very high and may damage the motor. To avoid any damages the additional resistance is needed to keep ~~the~~ the current safe.

Question 22 (7 marks)

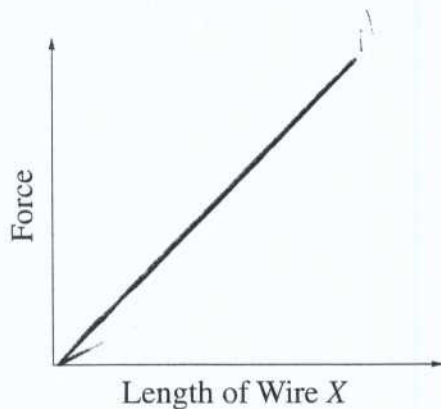
Two parallel wires are separated by a distance of 0.75 m. Wire X is 3.0 m long and carries a current of 2.0 A. Wire Y can be considered to be infinitely long and carries a current of 5.0 A. Both currents flow in the same direction along the wires.



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

Attractive force. i.e. X towards Y, Y towards X.

- (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



$$F = \frac{k I_1 I_2}{d^2}$$

- (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

Motor effect is when a current carrying wire experiences a force in a magnetic field. When a freely swinging coil carrying current was brought near a magnet the coil moved depending on how the magnet was held. The coil moved when the magnet was held in a way that the magnetic field lines were perpendicular to the coil. No force is exerted if the magnetic field lines are parallel to the coil.

Marks

Question 23 (6 marks)

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

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No sample available for Question 23, Band 5/6, Sample 2.