Question 16 **(12 marks)**

A group of physics students made a simple AC generator in class. It had 150 turns of wire in the 6.00 cm wide square coil and was placed in a magnetic field of strength 1.85×10^2 mT. They connected the handle to a motor which rotated it at 240 rpm and used the electricity produced to power a light globe.

(a) Calculate the maximum EMF produced by the generator. (5 marks)

_____ V

(b) Calculate the RMS voltage produced. (1 mark)

_____ V

The students removed the motor and turned the handle themselves, maintaining a constant speed of rotation. They noticed that the force required to turn it varied as the coil rotated. They also noticed that the light bulb glowed brightest when the force required was greatest and went out when the force required was virtually zero.

(c) (i) Explain why the force required varied as the handle went through one rotation. (3 marks)

(ii) In what position was the plane of the rotating coil relative to the field when the light bulb went out? Explain why it went out. (3 marks)