4 **(a)** Explain the term root mean square (r.m.s.) value of a current.

…………………..……………………………………………………………………….. [1]

(b) An a.c. generator consists of a rectangular coil of 800 turns with the dimensions 5.0 cm × 8.0 cm in a uniform magnetic field of magnitude 0.50 T. The coil has a resistance of 0.60 Ω and it is connected to an external load of resistance 11.4 Ω in a complete circuit. The coil is rotating at a constant speed of 240 revolutions per minute.

(i) Given that for a rotating coil, the e.m.f. induced is $NBA\omega \sin(\omega t)$, where N is the number of turns, B is the magnetic field strength, A is the cross-sectional area of the coil, ω is the angular velocity, and t is time, calculate the maximum voltage produced by this generator.

maximum voltage = …………….…… V [2]

(ii) Calculate the maximum current through the external load.

maximum current = …………………........ A [1]

(iii) Calculate the r.m.s. current through the external load.

r.m.s. current = …………………........ A [1]

(iv) On the axes below, sketch a graph of power dissipated, P in the external load against time, t for 2 cycles of the a.c. current. Include the value of the maximum power in the sketch. [3]

P/W

0

t/s

[Total: 8]