

Question	Answer	Marks
1	A	1
2	B	1
3	$I = \frac{V}{R} = \frac{1.8}{0.25} = 7.2 \text{ A}$ $F = ILB = 7.2 \times 0.08 \times 1.7 \times 10^{-4}$ $= 9.79 \times 10^{-5} \text{ N}$	1 1 1
4 a	Flux linking 1 turn of coil = $\frac{\text{total flux linkage}}{\text{number of turns}} = \frac{4 \times 10^{-4}}{400} = 1 \times 10^{-6} \text{ Wb}$	1
4 b	Flux density = $\frac{4 \times 10^{-4}}{1.25 \times 10^{-5}}$ = 32 Wb m^{-2}	1 1
5 a i	X marked on the highest point of the line.	1
5 a ii	Flux loop drawn with similar shape to others, centred on the same point and without touching other flux loops.	1
5 b	Average e.m.f. = $\frac{\text{change in flux linkage}}{\text{time taken}} = \frac{1.2 \times 10^{-3}}{0.25}$ = $4.8 \times 10^{-3} \text{ V}$	1 1
5 c i	(See Figure 7, Question 6) Graph with similar (sinusoidal) shape centred on the x-axis with the same time period as the graph shown and with $y = 0$ when $x = 0$.	1 1 1
5 c ii	Any two sensible suggestions for 1 mark each. Maximum 1 mark for explanations: <ul style="list-style-type: none"> • Increasing the number of turns on the coil. • Increasing the radius of the coils. • Increasing the strength of the magnet. • Because (for all 3) flux linkage = number of turns \times flux through one turn, and induced e.m.f = rate of change of flux linkage with time. 	3
6 a	Two loops with one side within the coil and the other out of the coil. The loops are horizontally symmetrical and do not touch each other.	1 1
6 b	Graph with similar (sinusoidal) shape with maxima when the graph of e.m.f. = 0 out of phase with the graph of e.m.f. by a quarter of a phase.	1 1 1
6 c	Both coils have the same flux through them at all times. So the ratio of e.m.f. across the coils is related only to the number of turns.	1 1
6 d i	Eddy currents are induced within the core due to the changing magnetic flux. (By Lenz's law) the eddy currents induce a magnetic flux to oppose the flux that induced the eddy currents.	1 1
6 d ii	The core can be laminated/built from various layers that are separated by insulating material. So that eddy currents across the core are reduced.	1 1