Answer *ALL* SIX questions from Section A and THREE questions from Section B.

The numbers in square brackets in the right-hand margin indicate the provisional allocation of maximum marks per sub-section of a question.

SECTION A

[Part marks]

1. (a) Write down Coulomb's law, defining the quantities involved. [2]
   (b) Define the electric field $\underline{E}$. [2]
   (c) Write down an expression for the electric field generated by a single point charge q. [2]
   (d) Write down the electric field due to a collection of point charges $q_1, q_2 \ldots q_n$. [2]
2. (a) Define the flux of the electric field. [2]
   (b) State Gauss' law for electrostatics in integral form. [2]
   (c) State Gauss' law for electrostatics in differential form. [2]
3. (a) Describe what is meant by "capacitor". [2]
   (b) Define the capacitance C of a capacitor. [2]
   (c) Write down the equivalent capacitance for two capacitors in series. [2]
   (d) Write down the equivalent capacitance for two capacitors in parallel. [2]
4. (a) Write down the Lorenz force, defining the quantities involved. [2]
   (b) Sketch the magnetic field lines near a bar magnet, clearly indicating the north and south poles of the magnet. [2]
   (c) Write down an expression for the magnetic force on a straight segment of current-carrying wire of length L and current I, in a magnetic field $\underline{B}$. [2]
5. (a) Define the flux of the magnetic field. [2]
   (b) State Gauss' law for magnetism in differential form. [2]
   (c) Write Ampère-Maxwell law in integral form. [2]
6. (a) State Faraday's law of induction, defining the quantities involved. [2]
   (b) Write down an expression for the self-induced EMF for an inductor of inductance L and current I. [2]
   (c) Write down an expression for the energy stored in an inductor of inductance L and current I. [2]