Capacitance – 2020 A2 Physics

1. Nov/2020/Paper_41/No.6

(a) Define *magnetic flux*.

– number of magnetic field lines passing normally to a given area

$\Phi = BA$.

[2]

(b) A simple transformer consists of two coils of wire wound on a soft-iron core, as illustrated in Fig. 9.1.

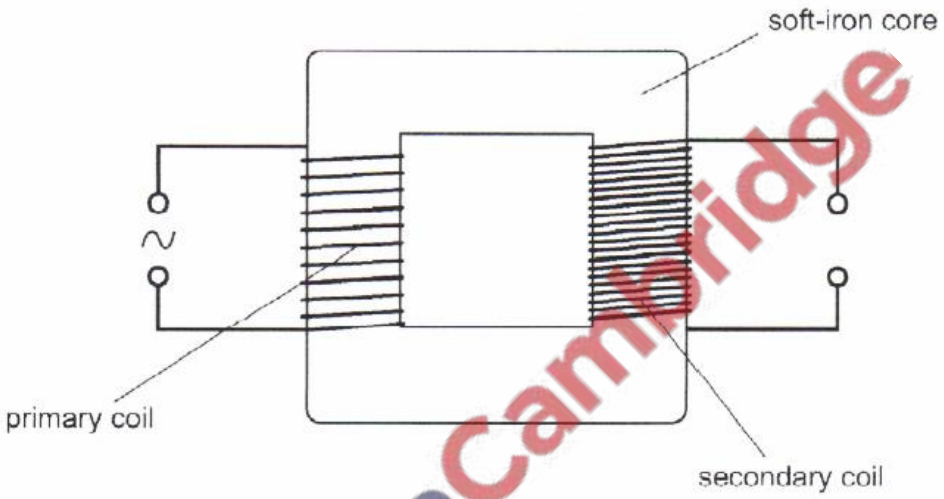

Fig. 9.1

There is a sinusoidal current in the primary coil.

Explain:

(i) how this current gives rise to an induced electromotive force (e.m.f.) in the secondary coil.

– The alternating current creates a changing magnetic flux which links with the secondary coil.

– The changing flux in the secondary coil induces e.m.f.

[3]

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(ii) why the e.m.f. induced in the secondary coil is not constant.

- the rate of change of the magnetic flux is not constant.
- Hence the induced e.m.f is proportional to rate of flux change. [2]

(c) Explain why the soft-iron core in (b) is laminated.

- Lamination reduces flow of eddy currents in the iron core. This then reduces the loss of energy due to energy dissipation [2]
the core heats ups due to eddy currents.

[Total: 9]

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2. Nov/2020/Paper_42/No.6

(a) (i) Define the *capacitance* of a parallel plate capacitor. $C = \frac{Q}{V}$

– Charge on one plate per unit potential difference between the plates.

[2]

(ii) State **three** functions of capacitors in electrical circuits.

1. Smoothing d.c from rectifiers
2. temporary power supply
3. tuning circuits

[3]

(b) A student has available **three** capacitors, each of capacitance 12 μF.

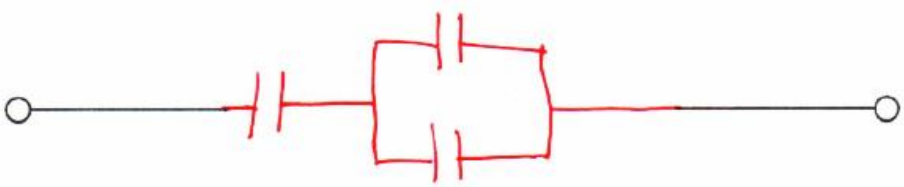
Draw diagrams, one in each case, to show how the student connects the capacitors to give a combined capacitance between the terminals of:

(i) 18 μF

$\frac{12 \times 12}{12+12} = 6 + 12 = 18\,\mu F$

[1]

(ii) 8 μF.



$12 + 12 = 24$

[1]

$\frac{24 \times 12}{24+12} = 8$

[Total: 7]

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