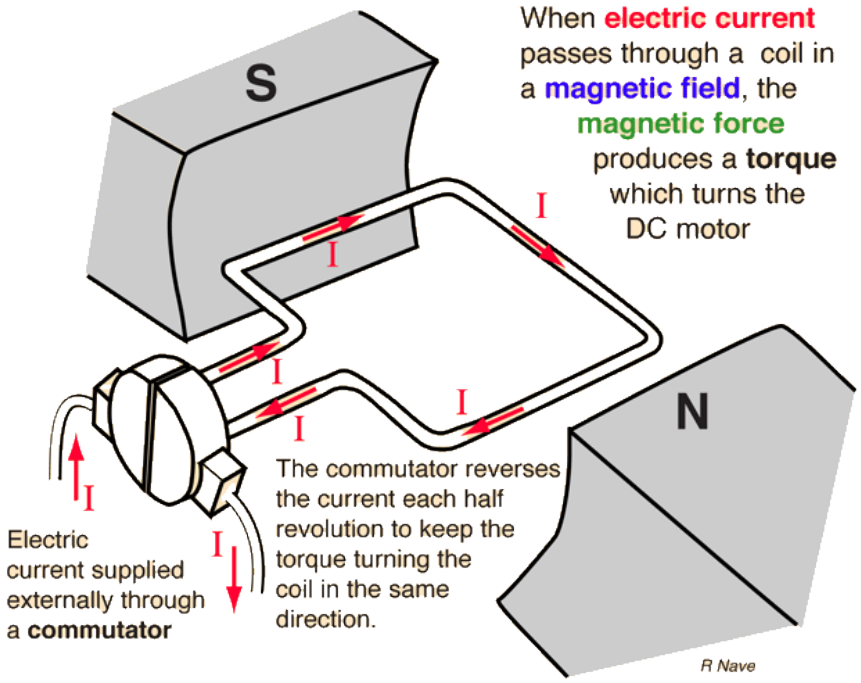
EE3103
Magnetism, AC and DC generation and DC motor workbook
11,12,13,13a,14,15,16

Student name



EE3103 electromagnetism assignment 1

Name .....

1) What is the difference between magnetic lines of flux and a magnetic field?

   …….

   …….

2) Which of the 2 terms above is the magnetic equivalent to an electric current?

   …….

3) What does flux density mean? ……..

4) Where on a bar magnet is the flux density greatest? ……..

5) What direction does the magnetic field flow externally around a bar magnet?

   ……

6) What is a difference between a permanent magnet and an electromagnet?

   ……

7) What combination of permanent, electro, soft and hard gives the strongest magnet?
   ……

8) Name 2 rules that illustrate rotation of a magnetic field around a current carrying conductor.
   …….

   …….

9) 2 conductors carrying current in the same direction cause ……

   2 conductors carrying current in opposite directions cause …….

10) What is the relationship between the distance from a current carrying conductor and the magnetic force found at that place.

    …….

11) What happens to a conductor in a magnetic field when current is suddenly passed through the conductor?

    ……..

12) What happens when you reverse that current? ……..

13) What rule is associated with motors? …….

14)What does the thumb stand for in this rule? .....

15)What is a difference between flux density and magnetic flux?

.....

16) Which direction does the magnetic field circulate around a conductor with the moving away?

.....

17) How does a relay work?

.....

.....

.....

18) How many coils minimum are there in an isolating transformer?

……..

19) Can a transformer work on a DC system? ……..

20) What provides the relative movement of the magnetic field to the coil in a transformer with no moving parts?

.....

.....

21) What is the difference between a relay and a contactor?

……..

22) When is electronic equipment encased in steel cabinets rather than plastic?

……

23) What is the unit of magnetic flux?

…….

24) What happens to sideways force when flux density increases?

……

EE3103 electromagnetism assignment 2

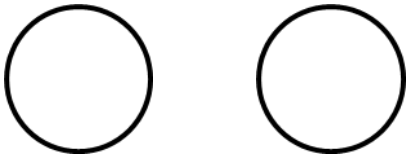
Name .....

Define, including relevant units, symbols, formulae and illustrations, each of the following magnetic terms

Magnetic term	**illustration**	**definition**
Permanent magnet		
Magnetic field strength		
Lines of force		
Magnetic poles		
Magnetic flux		
Flux density		

On the next page draw an illustration of 2 devices and describe how each works.
Choices : loud speaker, relay, electric bell, lifting magnet

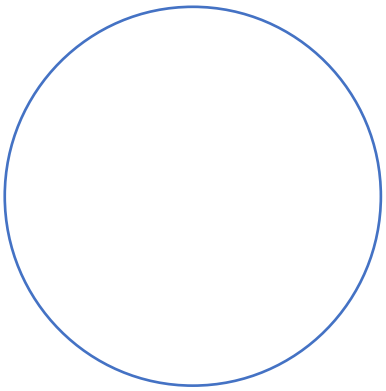
Illustrate each conductor to the right to show one having current moving away and the other one with current flowing towards you. Next indicate how the magnetic fields around each conductor would flow.



Soft iron core

Sketch on the soft iron bar on the left to show how it can be made into an electromagnet. Show current direction in the coil and use a magnetic rule to determine and record magnetic polarity

Finish the illustration below to show the components of an isolating transformer. The part below is the soft iron core. Bullet point the steps of operation



1) Apply an emf to the primary coil
2) .
3) .
4) .
5) .
6) .
7) .
8) If a load is attached to the secondary a current will flow

25072 AC Sine wave values worksheet assignment

Name.....

The **peak or maximum** part of the sign wave is the top of the curve.
This is the highest value.

The **RMS value** is 0.7071 x the peak value.
The **average value** is 0.637 x the peak value.
Both these values are always smaller than the peak value.

To find the **peak value** from the **RMS value**

$$\frac{\text{RMS value}}{0.7071} = \text{Peak value}$$

To find the **peak value** from the **average value**

$$\frac{\text{Average value}}{0.637} = \text{Peak value}$$

In both these last 2 situations the peak value is higher.

To convert a **frequency** (Hz) of cycles per second to the **period** in seconds we write the value of cycles per second into our calculator and use the $\mathbf{x^{-1}}$ button to give the period in seconds.

In reverse to convert the period in seconds to frequency in Hz we write the value of seconds into the calculator and use the $\mathbf{x^{-1}}$ button to give the frequency in Hz

Practice this to find answers to the conversions below.

Peak value	RMS value	Average value	frequency	period
10 volts			50 Hz	
	230 volts			15 secs
		188 volts	44.1kHz	
100 amps				.002 secs
	11kV		99MHz	
		207 volts		1000secs
566 volts			0.0001Hz	
325 volts				3 mins
	50 volts		18GHz	

And check your answers overleaf

Remember to check your values are in base units ie: seconds and hertz.
It is also preferable to use engineering multiples for your answers.

ANSWERS

Peak value	**RMS value**	**Average value**	**frequency**	**period**
10 volts	***7.071 volts***	***6.37 volts***	50 Hz	***0.02 secs***
325.3 volts	230 volts	***207.2 volts***	***67mHz***	15 secs
295 volt	***208.7 volts***	188 volts	44.1kHz	***22.7µsec***
100 amps	***70.71 amps***	***63.7 amps***	***500Hz***	.002 secs
15.56kV	11kV	***9.91kV***	99MHz	***10ηsecs***
325 volts	***230 volts***	207 volts	***1mHz***	1000secs
566 volts	***400 volts***	***360.5 volts***	0.0001Hz	***10ksecs***
325 volts	***230volts***	***207 volts***	***5.5mHz***	3 mins
70.71 volts	50 volts	***45.04 volts***	18GHz	***55.6ρsecs***

25072 AC generation assignment

Name.....

1) Which value is higher, average or RMS? ……

2) Define frequency ……..

3) The peak value is used to rate what part of a cable? ……

4) What is a hertz? ……

5) What does RMS stand for? ……

6) The RMS value relates to what effect? ……

7) What is the RMS value of a 100v peak? ……..

8) What is the average value of a 50v peak? ……...

9) What is the period of 10 Hz? ……..

10) What other names is RMS known as? ……

11) What is the instantaneous value of a 10v sine wave? ……

12) Define a wave cycle ……

13) Sketch below 2 cycles of a sine wave showing the positive and negative peaks and a positive maximum.

14) list definitions for RMS, average, peak, instantaneous, peak, frequency and period

15) Show 5 different rotation positions of a loop in a magnetic field.
Use Flemings RHR to determine current direction in each conductor.
Draw a graph of AC output labelling each of the 5 positions on the graph

25072 DC generation assignment

Name.....

1) Which Fleming's rule is used for a DC generator? …….

2) What will happen if more turns are wound on the generator armature?

……..

3) Give two reasons why carbon is used as the base material for generator brushes

……

……

4) What will happen if you turn the generator shaft slower?

……

5) What role does the magnetic field play in the generator?

……..

……..…

6) What will happen if you add more commutator bars and copper loops?

……..

……..

7) What is the difference between slip rings and a commutator with regards to the generator output?

…….

8) How does the strength of the magnetic field across the poles, relate to the output voltage on a DC generator?

……...

……...

9) Explain E = BLV

……..

……..

25072 DC motor assignment

Name.....

1) Which Fleming's rule is used for a DC motor? ……..…….

2) What stops carbon motor brushes losing excessive voltage across them while they are operating?

……..……

……..……

3) What will happen if you apply more volts to the motor leads?

……

4) Why would you add more poles to a DC motor?

……..

5) Where are most DC motors found?

……..