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A.C. generator

CLASS-XII

SUBJECT : PHYSICS
CHAPTER NUMBER: 07
CHAPTER NAME : ALTERNATING CURRENT

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LEARNING OUTCOME

After this lesson, students will be able:

- Explain from where electricity comes and how we use it.
- Define electrical energy in terms of charge, voltage, current and resistance.
- Identify the types of engineering careers that work primarily with electrical energy.

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Slide 2

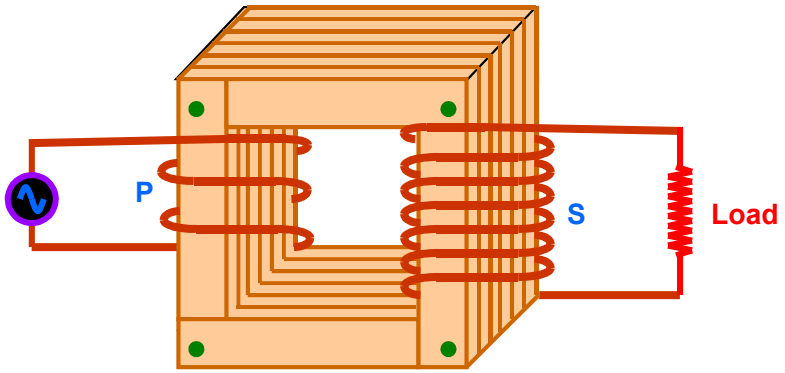
3	@Format for content and slide heading is missing? Just like you have mentioned in DOC., We need to specify, for each slide's heading and text content, what will be the font style +amanrouniyar@odmegroup.org _Assigned to you_ -Swoyan Satyendu , 6/17/2020

Transformer

Transformer is a device which converts lower alternating voltage at higher current into higher alternating voltage at lower current.

Principle:

Transformer is based on Mutual Induction.



Theory:

$E_P = - N_P \, d\Phi / dt$

$E_S = - N_S \, d\Phi / dt$

$E_S / E_P = N_S / N_P = K$

(where K is called Transformation Ratio or Turns Ratio)

For an ideal transformer,

Output Power = Input Power

$E_S I_S = E_P I_P$

$E_S / E_P = I_P / I_S$

$E_S / E_P = I_P / I_S = N_S / N_P$

Efficiency (η):

$\eta = E_S I_S / E_P I_P$

For an ideal transformer η is 100%

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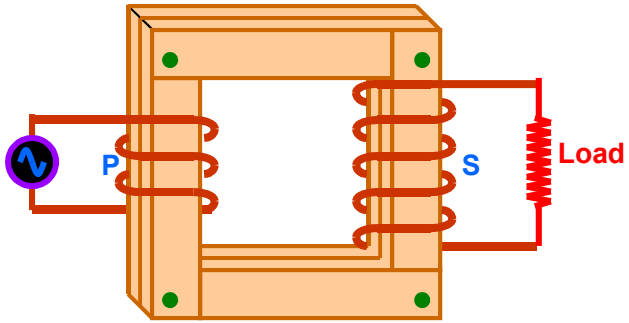
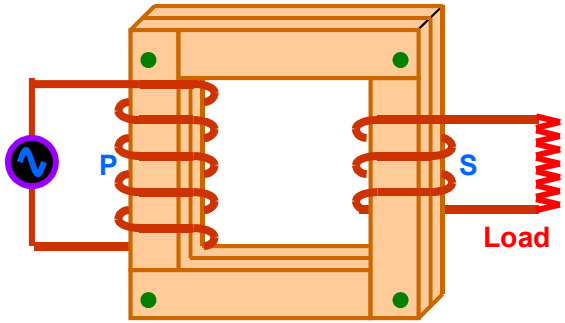
Step - up Transformer:



$N_S > N_P$ i.e. $K > 1$

$E_S > E_P$ & $I_S < I_P$

Step - down Transformer:



$N_S < N_P$ i.e. $K < 1$

$E_S < E_P$ & $I_S > I_P$

Energy Losses in a Transformer:

1. Copper Loss: Heat is produced due to the resistance of the copper windings of Primary and Secondary coils when current flows through them.

   This can be avoided by using thick wires for winding.

2. Flux Loss: In actual transformer coupling between Primary and Secondary coil is not perfect. So, a certain amount of magnetic flux is wasted.

   Linking can be maximised by winding the coils over one another.

3. **Iron Losses:**

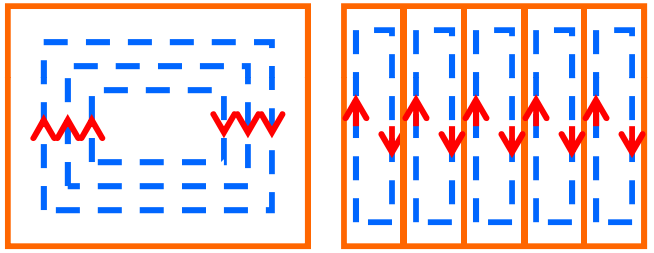
a) Eddy Currents Losses:

When a changing magnetic flux is linked with the iron core, eddy currents are set up which in turn produce heat and energy is wasted.

Eddy currents are reduced by using laminated core instead of a solid iron block because in laminated core the eddy currents are confined with in the lamination and they do not get added up to produce larger current. In other words their paths are broken instead of continuous ones.

b) Hysteresis Loss:

When alternating current is passed, the iron core is magnetised and demagnetised repeatedly over the cycles and some energy is being lost in the process.



Solid Core Laminated Core

This can be minimised by using suitable material with thin hysteresis loop.

4. **Losses due to vibration of core:** Some electrical energy is lost in the form of mechanical energy due to vibration of the core and humming noise due to magnetostriction effect.

HOME ASSIGNMENT

1. Two bulbs are rated $(P_1, V)\ and (P_2, V)$. If they are connected (i) in series and (ii) in parallel across a supply V, find the power dissipated in the two combinations in terms of P_1 and P_2 .
2. Two electric bulbs P and Q have their resistances in the ratio of 1:2. They are connected in series across a battery. Find the ratio of the power dissipation in these bulbs.

3. A 25 W and a 100W bulb are joined in (i) series (ii) parallel and connected to the main. Which bulb glows brighter?

THANKING YOU

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