UBND TỈNH LÂM ĐỒNG

TRƯỜNG CAO ĐẲNG ĐÀ LẠT

GIÁO TRÌNH

MÔN HỌC/MÔ ĐUN: TIẾNG ANH CHUYÊN NGÀNH

NGÀNH/NGHỀ: KỸ THUẬT ĐIỀU KHIỂN VÀ TỰ ĐỘNG HÓA

TRÌNH ĐỘ: CAO ĐẲNG

(LƯU HÀNH NỘI BỘ)

Lâm Đồng, năm 2020

TUYÊN BỐ BẢN QUYỀN

LỜI GIỚI THIỆU

Trong những năm gần đây công tác dạy nghề ngày càng được chú trọng, chương trình modun/ môn học cũng được các nhà trường và giáo quan tâm điều chỉnh cho phù hợp với nhu cầu thực tế của người học cũng như nhu cầu sản xuất của các doanh nghiệp.

Việc biên soạn giáo trình phục vụ công tác đào tạo Nghề trong những năm qua đã được Khoa Điện – Điện Tử quan tâm chỉ đạo xây dựng cho sát với chương trình môn học. Giáo trình phải được xây dựng theo hướng hạn chế các phạm trù lý thuyết gây mơ hồ cho HSSV mà thay vào đó giáo trình phải trợ giúp cho HSSV rèn luyện kỹ năng thực hành nhiều hơn.

Năm học 2020 – 2021 là năm học đầu tiên Khoa Điện – Điện Tử, Trường Cao Đẳng Nghề Đà Lạt triển khai đào tạo Nghề Kỹ thuật điều khiển và Tự động hóa trình độ Cao đẳng, do đó giáo trình này được biên soạn dựa trên yêu cầu phục vụ giảng dạy Nghề trọng điểm chất lượng cao giai đoạn 2020 – 2025, giáo trình này được xây dựng với nội dung, cách trình bày, phương pháp giảng dạy bám sát với chương trình môn học Trang bị điện Nghề Kỹ thuật điều khiển và Tự động hóa vừa được Khoa xây dựng để đào tạo trong các năm tới.

Đây là lần đầu tiên tác giả biên soạn giáo trình Tiếng Anh Chuyên Ngành Nghề Kỹ thuật điều khiển và Tự động hóa bám sát theo chương trình môn học được xây dựng để đào tạo theo tín chỉ, do đó có thể có nhiều nội dung trong giáo trình chưa phù hợp, chưa đáp ứng được yêu cầu của mọi người.

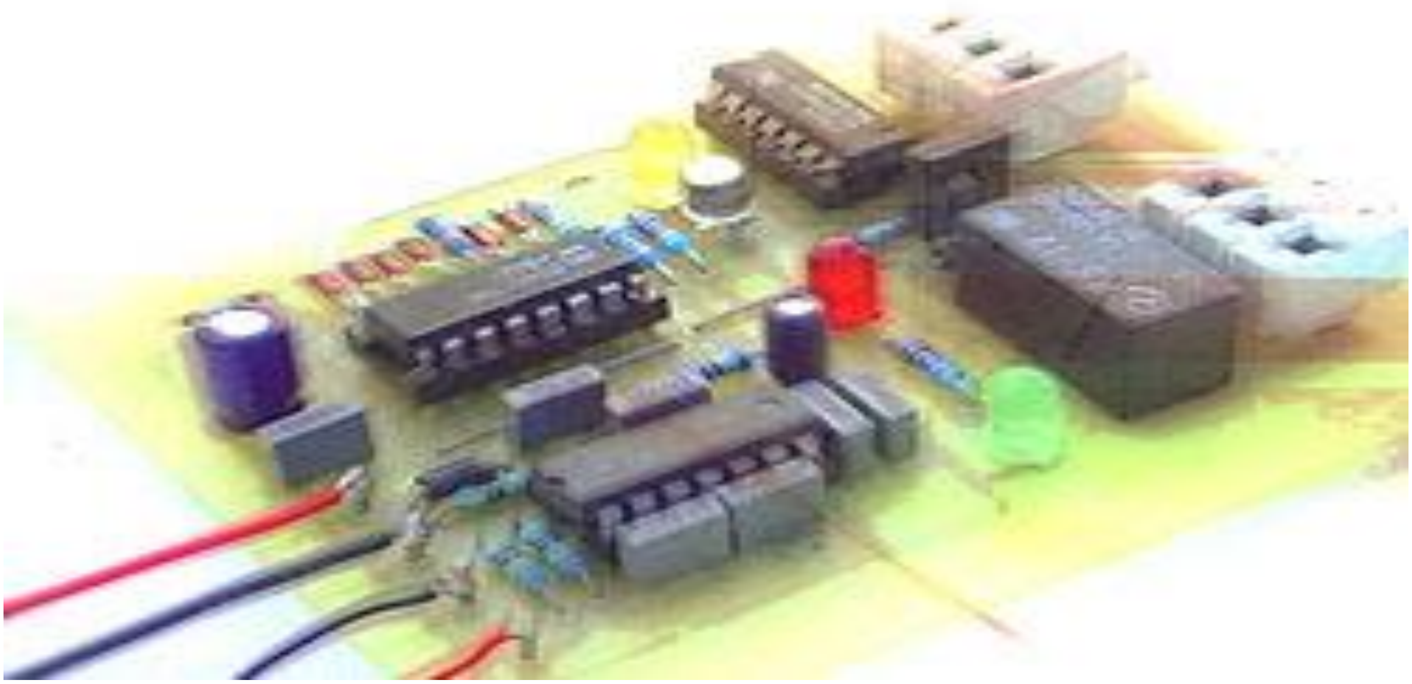
Rất mong các bạn HSSV, các đồng nghiệp và các đọc giả quan tâm góp ý kiến xây dựng để giáo trình máy điện ngày càng được hoàn thiện hơn. Xin chân thành cảm ơn./.

Đà Lạt, ngày 10 tháng 02 năm *2020*

Chủ Biên

Trịnh Hải Thanh Bình

ENGLISH FOR ELECTRICS



Dalat , 15 February , 2020

Contents

3. Grammar

Unit 5. Electric motor – AC motors

1. Tuning – up
2. Reading
   2.1 a technical AC motor
   2.2 Wound motor & squirrel cage
   2.3 Speed of the AC motor

Unit 6. Single phase AC induction motors

1. Tuning – up
2. Reading
   2.1 Technical reading1
   2.2 Technical reading 2
   2.3 Technical reading 3
   2.4 Technical reading 4

Unit 7. Home appliances

1. Tuning – up
2. Reading
   2.1 Remote control
   2.2 Video cassette recorder

Unit 8. Transformers

1. Tuning – up
2. Reading
   2.1 transformer
   2.2 current transformer
3. Grammar

INTRODUCE

<u>Electronics in the home</u>

Rice cooker	*Washing machine*	*Television*
Air – conditioner	*Radio Fan*	

Task 1. Make a list things in your house which use electronic.Compare your list with that of another group.

Task 2.Match the pictures with the names in the box.Compare with another group.

Reading

Read for a purpose

Task 3.Read quickly through the text . Tick [✓] any items mentioned in the list you made in task 1.

Electronics in the home

Electronics began at the start of twentieth century with the invention of the vacuum tube. The first devices for everyday use were radios, followed by televisions, record players, and tape recorders. These devices were large and used a lot of power.

The invention of the transistor in 1947 meant that much smaller, low-powerd devices could be developed. A wide variety of electronic devices such as hi-fi units and portable radio became common in the home.

It was not until 1958 that microelectronics began with the development of Ics(integrated circuits) on silicon chips. This led to a great increase in the used of electronics in everyday items. The introduction of the microprocessor allowed electronics to be used for the control of many common processes.

Microprocessors are now used to control many household items such as automatic washing-machines, dishwasher, central heating systems, sewing machine, and food processors. Electronic timer are found in digital alarm clocks, water heaters, electric cookers, and microwave ovens. Telephones use electronics to provide automatic dialing and answerphone facilities. New entertainment devices have been developed, such as video recorders and CD (compact disc) player.

In the future, electronics are likely to become even more common in the home as multimedia entertainment systems and computer-controlled robots are developed.

Task 4. *Fill in the gaps in this table with the help of the text*

Date	Invention	Applications in the home
Early 20th century	-------------------------------------	-----------------------------
--------------------------	Transistor	-----------------------------
1958		Automatic washing-machines,
Future	----------------------	------------------------------

Task 5: Make a list of ways in which you think electronics may be used in the home in the future.

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………
………………………………………………………………………………

UNIT 1:

Component values

Tuning – up

Resistor values

***Task 1: Fill in in the missing colours in this table with the help of the text*.**

Resistors

Reading the resistor code

Resistors are coded with colored bands to ease the problem of marking such small components. The numbers corresponding to the ten colours used and the values per position are shown above. For example,180,000 ohms is coded with the first digit brown, then grey and finally yellow. The fourth band indicates the tolerance that value has with respect to the stated value. For example, silver indicates 10% tolerance, meaning that the 180,000 ohms could vary between 180,000 ± 18,000, i.e. 162,000 to 198,00. These tolerances may seem to reflect poor manufacture but in most circuits they are, in fact, quite satisfactory. Relaxing the tolerance enables the marker to sell them more cheaply.

***Task 2. Find the values and tolerances of resistor banded as folllows. The compare your answers with your partner*.**

1	Red	Violet	orange	Silver
2	Blue	Grey	brown	gold
3	Green	Blue	red	silver
4	Red	Red	green	----------
5	brown	Black	orange	---------
6	orange	Orange	brown	gold
7	yellow	Orange	red	gold
8	brown	Green	green	--------
9	violet	Green	brown	red
10	white	Brown	red	red

Technical reading

Capacitor values

Task 3. Use the following information to name the colour bandings of the capacitors below.

(Note: 1nF = 1000 pF)

For example: 220pF,2.5%

Band 1 red = 2 Band 3 brown= one zero

Band 2 red = 2 Band 4 orange = 2.5% tolerance

		4	5
colour	Black	20%	------
	White	10%	------
	Green	5%	------
	Orange	2.5%	------
	Red	2%	250V
	Brown	1%	------
	yellow	------	400V

C280 capacitor colour coding.The first three bands give the value (in pF) using the same system as for the four band resistor coding.

1. 100 pF,20% **3** 22 nF, 5% 250V

2. 180 pF, 10% **4** 47 nF,20%

Task 5. Technical reading

Diode code

Identify these diodes with the help of the text below.

1 BAX16 **2** BY126 **3** BZX55C2V4 **4** AA119 **5** BPX65

Diode coding

The European system for classifying semiconductor diodes involves an alphanumeric code which employs either two letters and three figures (general purpose diodes) or three letters and two figures (special purpose diodes). The first two letters have the following significance:

First letter – semiconductor material:

A germanium
B silicon
C gallium arsenide ect.
D photodiodes ect

Second letter – application:

A general purpose diode
B tuning (varicap)
E tunnel diode
P photovoltaic diode
Q light-emitting diode
T controlled rectifier
X varactor diode
Y power rectifier
Z zener diode

In the case of diodes for specialized applications, the third letter does not generally have any particular significance. Zener diodes have an additional letter (which appears after the numbers) which denotes the tolerance of the zener voltage. The following letters are used:

A ± 1% B ± 2% C ± 5% D ± 10%

Zener diodes also have additional characters which indicate the zener voltage (e.g. 9V1 denotes 9.1 V).

Example : Identify each of the following diodes:

(i) AA 113 (ii) BB 105 (iii) BZY 88C4V7

Diode (i) is a general – purpose germanium diode.

UNIT 2

ELECTRICAL & PROTECTIVE DEVICES

Tuning up : Matching

1. Fuses 	a. Protect a particular circuit
2. Miniature circuit breaker (MCB) 	b. a very basic protection device which is destroyed (i.e. it 'blows') and breaks the circuit should the current exceed the rating of the fuse
3. Residual curreent device (RCD) 	c. Protect individual circuit is that if one circuit trips, it will not shut down the whole house, just the protect circuit.
4. Residual current breaker with overload protection (RCBO)	d. the advantage of MCBs over fuses is that if they trip, they can be reset - they also offer a more precise tripping value.

Technical reading 1

Circuit breaker (CB)

A circuit breaker (CB) is an automaticallyoperated electrical switch, which is designed to protect an electrical circuit from damage caused by overload or short circuit. Unlike a fuse, which has to be replaced when it blows, a circuit breaker can be reset, then switch on after the fault in the circuit has been cleared. Circuit breakers have current ratings from a few amperes to thousand of amperes. Notice that the breaker has a toggle, which can be used manually, like a switch. The difference is that an internal mechanism can also open the switch if the current is too high. Miniature circuit breakers (most common type for 240 V circuits) are classified by the method used to cause the mechanism to trip open. The methods are: thermal,magnetic, thermal –, electronic. There are many different technologies used in circuit breakers and the do not always fall into distinct categories. The following types are common in domestic, commercial and light industrial applications for low voltage (less than 1000 V) use.

- MCB (miniature circuit breaker) rate current not more than 100A. trip characteristics normally not adjustable. Thermal or thermal- magnetic operation. Breakers illustrated above are in this category.
- MCCB (Moulded case circuit breaker)rate current up to 1000 A. thermal or thermal –magnetic operation. Trip current may be adjustable.
- Air circuit breaker Rate current up to 10000 A. Trip characteristics often fully adjustable including configurable trip threshold and delays. Usually electronically controlled – some models are microprocessor controlled. Often used for main power distribution in large industrial plant, where the breakers are arranged in draw- out enclosures for ease of maintenance.
- Vacuum circuit breaker with rated current up to 3000 A, these breakers interrupt the arc in a vacuum bottle. These can also be applied at up to 35,000 V. Vacuum beakers tend to have longer life expectancies between overhaul than do air circuit breakers.

Task 1: True/ False

1. The circuit breakers are like the fuses.
2. The operation of MCB is electronic.
3. The trip current of MCB cannot be adjustable.
4. Air circuit breaker rates current up to 10,000 mA.

Technical reading 2

In electronics and electrical engineering a fuse , short for “fusible link”, is a type of over- current protect device. It has as its critical component a metal wire or trip that will melt when heated by a precribed (design) current, opening the circuit of which it is a part, thereby protecting the circuit from an over-current condition.

1. Actuator lever
2. Actuator mechanism
3. Contacts
4. Terminals
5. Bimetallic strip
6. Calibration screw
7. Selenoid: is a loop of wire, often wrapped around a metallic core, which produces a magnetic field when an electrical current is passed through it
8. Arc divider / extinguisher

Structure of circuit breaker

Breakers for protections against earth faults too small to trip an over-current device:

- RCD- Residual current device (formerly known as a residual current circuit breaker) – detects current imbalance. Does NOT provide over – current protection.
- RCBO – Residual current breaker with over-current protection – combines the functions of an RCD and an MCB in one package. In the United States and Canada, panel-mounted devices that combine ground (earth) fault detection and over – current protection are called Ground Fault Circuit Interrupter (GFCI) breakers; a wall mounted outlet device providing ground fault detection only is called a GFCI.
- ELCB –Earth leakage circuit breaker. This detects earth current directly rather than detecting imbalance. They are no longer seen in new installations for various reasons.

Task 2. Fill in the gaps in the following sentences by using information from above passage.

1. ………………………….is a loop of wire, often wrapped around a metallic core, which produces a magnetic field when an electrical current is passed through it.
2. …………………………used to manually trip and reset the circuit breaker. Also indicates the status of the circuit breaker (ON or Off/ Tripped)
3. …………………………forces the contacts together or a apart.
4. ……………………allow current to flow when touching and break the flow of current when moved apart.
5. ………allow the manufacturer to precisely adjust the trip current of the device after assembly.
6. ………………………is used to convert a temperature change into mechanical displacement.

Task 3**.**Matching by using information from passaage 1 and 2.

1. RCD	a. Detect earth current
2. ELCB	b. Detect current imbalance
3. CB	c. Fault and over-current protection
4. RCBO	d. Overload or short circuit protection

UNIT 3

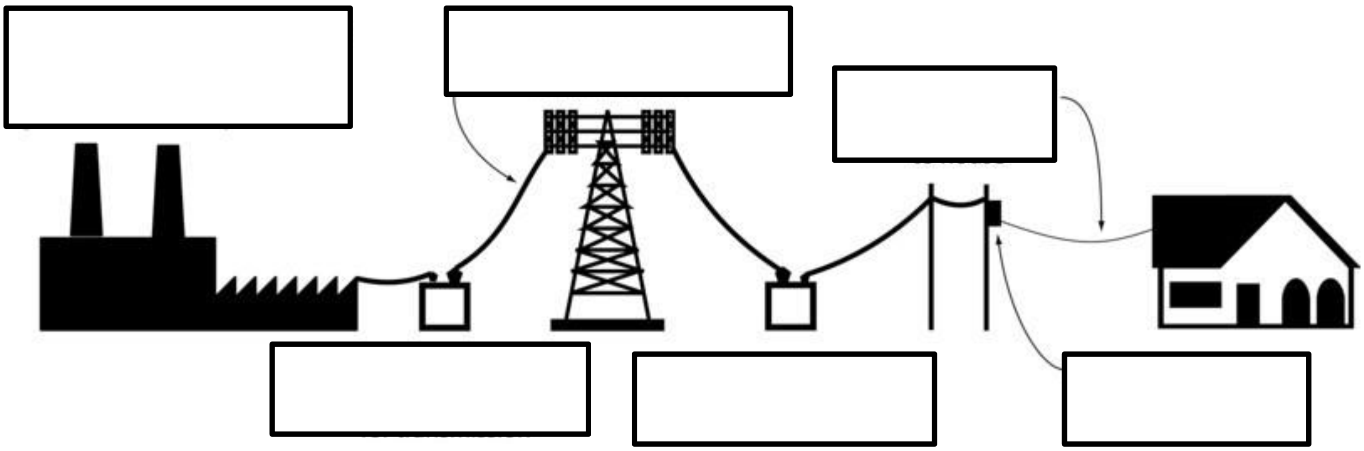
POWER SUPPLY

Tuning - up:

The electricity produced by a generator travels along cables to a transformer, which changes electricity from low voltage to high voltage. Electricity can be moved long distances more efficiently using high voltage. Transmission lines are used to carry the electricity to a substation. Substations have transformers that change the high voltage electricity into lower voltage electricity.From the substation, distribution lines carry the electricity to homes,offices and factories,which require low voltage electricity.

Task 1: Complete the blanks:

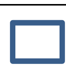
TRANSPORTING ELECTRICITY



Power plant: generates electricity
Transmission line: carries electricity long distances
Transformer: steps up voltage for transmission
Neighborhood transformer: steps down voltage
Transformer on pole: steps down voltage before entering house
Distribution line : carries electricity to house

Technical reading 2

Electrical symbols can vary widely, but the following closely adhere to industry saatndards. Indusry standard symbols are modified to meet client- and/or project-specific requirements.

Switches	
S	Single –pole switch
S 2	Double –pole switch
S 3	3 – way switch
S 4	4- way switch
S p	Single –pole switch and pilot light
S be	Boiler emergency switch
S DM	Single- pole dimmer switch
S DM3	3- way dimmer switch
ST	Single- pole switch with thermal overload protection
	Push button switch
	Variable frequency drive
	Electric motord

One- line	
	1. Current transformer
	1. Potential transformer
	2. Fuse
	3. Fuse cut out
	4. Fuse and switch
	5. Switch
	6. Circuit breaker
	7. Draw- out circuit breaker
	8. Medium voltage draw-out circuit breaker
	9. Bus plug circuit breaker
	10.Bus plug fuse & switch
	11.Ground
	12.Thormal overload
	13.Relay/ coil
	14.N/O contact
	15.N/C contact
	16.Protective relay
	17.Ammeter
	18.Ammeter switch
	19.Voltmeter
	20.Voltmeter switch
	21.Wattmeter
	22.Watt-hour demand meter
	23.Transformer
	24.Auto transformer
	25.Lighting arrester
	26.Generator
	27.Delta
	28.WYE
	29.Key interlock
	30. Automatic transfer switch (A.T.S)
	31.Fused disconnect switch with switch size over fuse size

Task 2: Fill in the gaps in the following sentences by using information from above passage:

1. ……………………is instrument for measuring in volts the difference of potential between different points of electrical circuit.
2. ……………………is a device that produces electrical energy from a mechanical energy source.
3. ……………………is an electro-dynamic instrument for measuring the electric power.
4. ……………………is designed to provide a current in its secondary,which is accurately proportional to the current flowing in its primary.
5. …………………..is an electrical switch that opens and closed under control of another electrical circuit.
6. …………………is system for controlling the rotational speed of an alternating current (AC) electrical circuit.
7. …………………is a device for changing the course (or flow) of a circuit.
8. …………………..is an automatically operated electrical switch , which is designed to protect an electrical circuit from damage caused by overload or short circuit.

Technical reading

In order to provide electrical service to a building or buildings, you must first determine what type of system is available from utility company or from a privately owned and operated system such as might be found on a college or university campus or industrial or commercial complex, as the case may be. Once this is known, it is very important to understand the characteristic of the system – not only voltage, capacity, and available fault current but also the operational, reliability and relative cost characteristics inherent to the system by virtue of its configuration or arrangement, the most appropriate service and distribution system for the application at hand can be determined.

- Radial Circuit Arrangement in commercial buildings
  Diagram 1

Characteristics:

- Simplest and lowest cost way of distributing power
- Lowest reliability. A fault in the supply circuit, transformer, or the main bus will cause interruption of service to all loads.

- Modern distribution equipment has demonstrated sufficient reliability to justify use of the radial circuit arrangement in many applications.
- Most commonly used circuit arrangement

Diagram 2.

Characteristics

- Multiple small rather than single large secondary substation.
- Used when demand, size of building , or both may be required to maintain adequate voltage at the utilization equipment.
- Smaller substations located close to center of load area.
- Provides better voltage conditions, lower system losses, less expensive installation cost than using relatively long, high – amperage, low- voltage feeder circuits.
- A primary feeder fault will cause the main protective device to operate and interrupt service to all loads. Service cannot be restored until the source of trouble has been eliminated.
- If a fault was in a transformer, service could be restored to all loads except those served by that transformer.

Task 3: Fill in the diagram 1 and 2 by using information from passage 2

Task 4: Reading comprehensive by using information from passage 3

1. What are the advantages of Radial Circuit Arrangement in commercial building?
   ……………………………………………………………………………………
   ……………………………………………………………………………………
   …………………………
2. What are the disadvantages ofRadial Circuit Arrangement in commercial building?
   ……………………………………………………………………………………
   ……………………………………………………………………………………
   …………………………
3. What are the advantages of Radial Circuit Arrangement Common primary feeder to secondary unit substations?

…………………………………………………………………………………
…………………………………………………………………………………
…………………………

4. What are the disadvantages of Radial Circuit Arrangement Common primary feeder to secondary unit substations?

   …………………………………………………………………………………
   …………………………………………………………………………………
   …………………………

Grammar:

- **Article : a/an**
- **Passive voice**
- **Preposition : up, of, with, into……..ect**

  …………………………………………………………………………………
  …………………………………………………………………………………
  …………………………………………………………………………………
  ……………………………………….
- **Relative clauses**:

  There are three kinds of relatives: defining, non-defining, and connective.

  Eg:

  The curcuit breaker that he replaced is right.

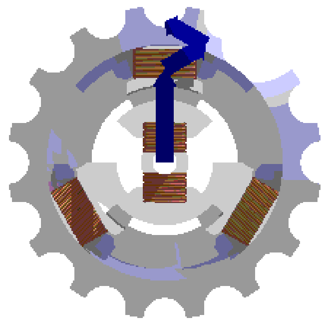
  The bulb, which you have bought from the shop, has a problem.

  He is an electrician, who set up the electric system for LG company.

UNIT 4.

ELECTRIC MOTOR – DC MOTOR

Tuning up



Most magnetic motors are rotary, but linear types also exist. In a rotary motor, the rotating part (usually on the inside) is called the rotor, and the stationary part is called the stator. The rotor rotates because the wires and magnetic field are arranged so that a torque is developed about the rotor's axis. The motor contains electromagnets that are wound on a frame. Though this frame is often called the armature, that term is often erroneously applied. Depending upon the design of the machine, either the rotor or the stator can serve as the armature.

One of the first electromagnetic rotary motors was invented by Michael Faraday in 1821. The modern DC motor was invented by accident in 1873. The classic Dc motor has a rotating armature in the form of an electromagnet with two poles. A rotary switch called a commutator reverses the direction of the electric current twice every cycle, to flow through the armature so that the poles of the electromagnet push and full against the permanent magnets on the outside of the motor. As the poles of the armature electromagnet pass the poles of the permanent magnets, the commutator reverses the polarity of the armature electromagnet. During that instant of switching polarity, inertia keeps the classical motor going in the proper direction.

Task 1: Read the passage and decide these statements True or False :

1. Most magnetic motors are stationary
2. The rotor rotates because the wires and magnetic fields.
3. Depending upon the design of the machine, not only rotor but also stator serve as the armature.

4. DC motor was invented by accident in 1873.
5. The classic DC motor has a rotating armature in the form of an electromagnet with a couple of poles.

Technical reading 2

DC motor speed generally depends on a combination of the voltage and current flowing in the motor coils and the motor load or biking torque. The speed of the motor is proportional to the voltage, and the torque is proportional to the current. The speed is typically controlled by altering the voltage or current flow by using taps in the motor windings or by having a variable voltage supply.

As this type of motor can develop quite high torque at low speed it is often used in traction applications such as locomotives.

However, there are a number of limitations in the classic design, many due to the need for brushes to rub against the commutator. The rubbing creates friction, and the higher the speed, the harder the brushes have to press to maintain good contact. Not only does this fiction make the motor noisy, but it also creates an upper limit on the speed and causes the brushes eventually to wear out and to require replacement. the imperfect electric contact also causes electrical noise in the attached circuit. These problems vanish when you turn the motor inside out, putting the permanent magnets on the inside and the coils on the outside thus designing out the need for brushes in a brushless design. However such designs need electronic circuits to control the switching of the electromagnets (the function that is performed in conventional motors by the commutator).

Wound field DC motor

The permanent magnets on the outside (stator) of a DC motor may be replaced by electromagnets. By varying the field current it is possible to alter the speed/torque ratio of the motor. Typically the field winding will be placed in series (series wound) with the armature winding to get a high torque low speed motor, in parallel (shunt wound) with the armature to get high torque motor, or to have a winding partly in parallel, and partly in series (compound wound) for a balance. Further reduction in field current are possible to gain even higher speed but correspondingly lower torque.This technique is ideal for electric traction and many simillar application where its use can eliminate the requirement for a mechanically variable transmission. Generally speaking the rotational speed of a DC motor is proportional to the voltage applied to it , speed control can be achieved by variable battery tappings,resistors or electronic controls.The direction of a wound field DC motor can be changed by reversing either the field or armature connections but not both, this is commonly done with a special set contactors (direction contactors).

Task 3: Work in group of 5 students to discuss about these details as said below and then present in front of class:

1. The speed of DC motors.
2. Advantages and dis advantages of DC motors. Give solution for disadvantages.
3. Types of wound field.
4. The characteristic of series wound, shunt wound, compound wound.
5. How to control the speed of DC motors.
6. How to change the direction of a wound field DC motor.
7. Applications of DC motor.

Technical reading 3

Universal motors

A variant of the wound field DC motor is the universal motor. The name derivers from the fact that it may use AC or DC supply current, although in practice they are nearly always used with AC supplies. The principle is that in a wound field DC motor the current in both the field and armature (and hence the resultant magnetic fields) will alternate (reverse polarity) at the same time, and hence the mechanical force generated is always the same. In practice the motor must be specially designed to cope with the AC current (impedance /reluctance must be taken into account), and the resultant motor is generally less efficient than an equivalent pure DC motor.

The advantage of the universal motor is that AC supplies may be used on motors which have a typical characteristic old DC motors, specifically high starting torque and very compact design if high running speeds are used. The negative aspect Is the maintenace and reliability problems caused by the commutator, and as a result such motor in devices such motors will rarely be found in industry but are the most common type of AC supplied motor in devices such as food mixers and power tools which are only used intermittently.

Continuous speed control of a universal motor running on AC is very easily accomplished using a thyristor circuit while stepped speed control can be accomplished using multiple taps on the field coil. Household blenders that advertise many speeds frequently combine a field coil with serveral taps and a diode that can be inserted in series with the motor (causing the motor to run on half-wave DC with hlf the RMS voltage of the AC power line).

Task 4: Fill in the gaps in the following sentences by using information from passage 3:

1. ………………is an electrical switch that periodically reverses the current in an electric motor or electrical generator.
2. ……………… is a solid-state semiconductor device with four layers of alternating N and P-type material.
3. ……………… is one of the principal components of an electro-mechanical machine – a motor or generator.
4. ………………can be thought of informally as " rotational force"
5. Alternating current is abbreviated to………………..
6. Direct current is abbreviated to………………………
7. Root mean square is abbreviated to………………………
8. Round per minute is abbreviated to………………………

Grammar :

- **Article : a/an**
- **Preposition : up,of, with, into**
- **Conjunctions:**

  Co-ordinating conjunctions: and, but, both….and, or, either….or, neither…….or, not only …..but also.

  Eg: Not only rotor but also stator serve as the armature.

Unit 5:

ELECTRIC MOTOR –AC MOTORS

Tuning – up

Technical reading 1

A technical AC motor consists of two parts : an outside stationary stator having coils supplied with AC current to produce a rotating magnetic field. An inside rotor attached to the output shaft that is given a torque by the rotating field.There are two fundamental types of AC motor depending on the type of rotor used:

- The synchronous motor, which rotates exactly at the supply frequency or a sub-multiple of the supply frequency.
- The induction motor, which turns slightly slower, and typically (though not necessarily always) take the form of the squirrel cage motor.

For higher-power applications where a poly –phase electrical supply is available, the three- phase (or poly-phase) AC induction motor is used. The phase differences between the three phases of the poly-phase electrical supply create a rotating electromagnetic field in the motor. The rotor must always rotate slower than the rotating magnetic field. Induction motors are the workhorses of industry and motors up to about 500kW in output are produced in highly standardized frame sizes, making them nearly completely interchangeable between manufacturers.

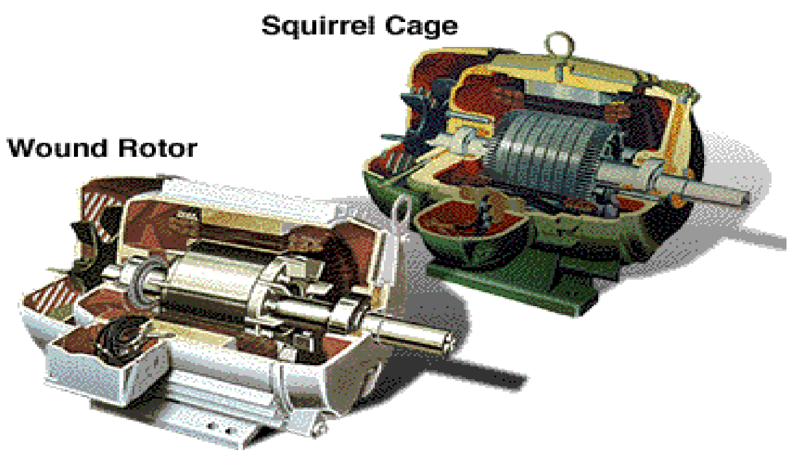
Task 1: Reading comprehension:

1. What does a typical AC motor include?
   ……………………………………………………………………………………
   ……………
   ……………………………………………………………………………………
   ……………
2. What is synchronous motor?
   ……………………………………………………………………………………
   ……………
   ……………………………………………………………………………………
   ……………
3. What is induction motor?
   ……………………………………………………………………………………
   ……………
   ……………………………………………………………………………………
   ……………
4. Why is a typical AC motor used?
   ……………………………………………………………………………………
   ……………
   ……………………………………………………………………………………
   ……………
5. How can the rotating elctromagnetic field in the motor creat?
   ……………………………………………………………………………………
   ……………
   ……………………………………………………………………………………
   ……………

Technical reading 2

Compared to squirrel cage rotors, wound rotors are expensive and require maintenance of the slip rings and brushes, but they were the standard form for variable speed control before the advent of compact electronic devices. Transistorizedinverters with variable frequency drive can now be used for speed control and wound rotor motors are becoming less common. (Transistorized inverter drives also allow the more- efficient three-phase motors to be used when only single –phase mains current is available.)

Several methods of starting a poly-phase motor are used. Where the large inrush current and high starting torque can be permitted,the motor can be started across the line,by applying full line voltage to the terminals. Where it is necessary to limit the starting inrush current (where the motor is large compared with the short-circuit capacity of the supply), reduced voltage starting using either series inductors, an autotransformer, thyristor or other devices are used. A technique sometimes used is star-delta starting, where the motor coils are initially connected in wye for acceleration of the load , then switched to delta when the loadd is up to speed. Transistorized drives can directly vary the applied voltage as required by the starting characteristics of the motor and load.



Task 2: True / False

1. To limit the starting inrush current, we decrease voltage starting using series inductors.
2. To limit the starting inrush current, we can use delta-star starting.
3. We can not use thyristors to limit the starting inrush current.
4. Using the wound rotor motors are more expensive than squirrel cage rotors
5. Transistorized inverters with variable frequency drive are able to use for speed control.

Technical reading 3

The speed of the AC motor is determined primarily by the frequency of the AC supply and the number of poles in the stator winding, according to the relation:

$$Ns = 120\ F/p$$

Where

Ns = Synchronous speed, in revolutions per minute

F = AC power frequency

p = number of poles, usually an even number but always a multiple of the number of phases.

Actual RPM for an induction motor will be less than this calculated synchronous speed by an amount known as slip that increases with the torque produced. With no load the speed will be very close to synchronous. When loaded, standard motors have between 2-3% slip, special motors may have up to 7% slip, and a class of motors known as torque motors are rated to operate at 100% slip (0 RMP/full stall).

The slip of the AC motor is calculated by:

$$S = (Ns-Nr) / Ns$$

Where Nr = Rotational speed, in revolutions per minute.

S = slip in percent

The speed in this type of motor has traditionally been altered by having additional sets of coils or poles in the moto that can be switch on and off to change the speed of magnetic field rotation. However, developments in power electronics mean that the frequency of the power supply can also now be varied to provide a smoother control of the motor speed.

Three –phase AC synchronous motors

If connections to the rotor coils of a three –phase motor are taken out on slip-rings and fed a separate field current to create a continuous magnetic field (or if the rotor consists of a permanent magnet), the result is called a synchronous motor because the rotor will rotate in synchronism with the rotating magnet field produced by the poly-phase electrical supply. A synchronous motor can also be used as an alternator.

Nowadays, synchronous motors are frequently driven by transistorized variable frequency drives.This greatly eases the problem of starting the massive rotor of a large synchronous motor. They may also be started as induction motors using a squirrel-cage winding that shares the common rotor: once the motor reaches synchronous speed, no current is induced in the squirrel- cage winding so it has little effect on the synchronous operation of the motor.

Task 3: Reading comprehension

1. What is a synchronous motor?
   ………………………………………………………………………………………
   ……………..
   ………………………………………………………………………………………
   …………….
2. What type of driven is synchronous motor used?
   ………………………………………………………………………………………
   ……………….……………………………………………………………………….
   ………………………….
3. Can synchronous motor start as induction motors? How?
   ………………………………………………………………………………………
   ……………….……………………………………………………………………….
   ………………………….

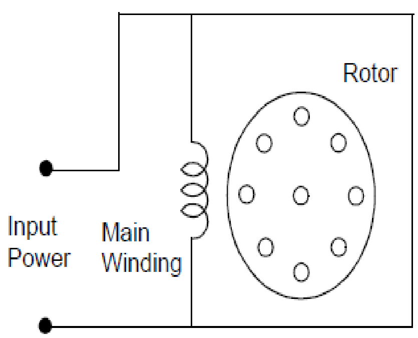
⇨ **Question**:
A typical four-pole motor running on 60 Hz might have a name plate rating 1725 RPM at full load. Calculate the speed of motor.
Solution
:……………………………………………………………………………………….
……………….……………………………………………………………………….
…………………………

Unit 6:

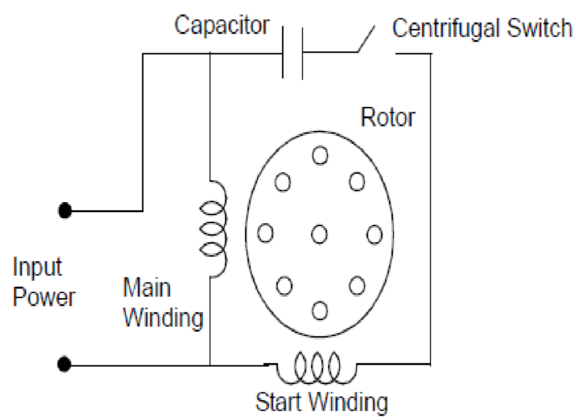
SINGLE-PHASE AC INDUCTION MOTORS

Tuning- in

1. What are they?
2. Where cau you see them?



Single-Phase AC Induction Motor without Start Mechanism



Single-Phase AC Induction Motor with Start Mechanism

Technical reading 1

A poly – phase induction motor will continue to rotate even if one phase is disconnected , at reduced torque. However, a poly –phase motor at standstill will not generate any net starting torque if connected only to a single-phase supply. The key to the design of single-phase motors, then, is to provide a rotating magnetic field to produce starting torque.

A common single-phase motor is the shade pole motor, which is used in devices requiring lower torque, such as electric fans or other small household appliances. In this motor, small single-turn copper "shading coils" create the moving magnetic field. Part of each pole is encircled by a copper coil or strap; the induced current in the strap opposes the change of flux through the coil (Lenz's Law), so that the maximum field intensity moves across the pole face on each cycle.

Because it has but a single alternating current source, a single – phase motor can only produce an alternating field : one that pulls first in one direction, then in the opposite as the polarity of the field switches. A squirrel-cage rotor placed in this field would merely twitch,since there would be no moment upon it.If pushed in one direction, however,it would spin.

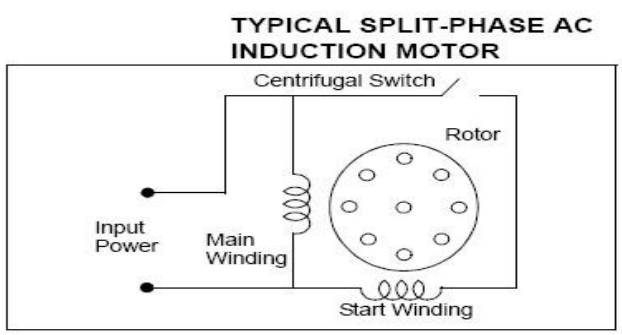
The major distinction between the different types of single –phase AC motor is how they go about starting the rotor in a particular direction such that the alternating field will produce rotary motion in the desired direction. This is usually done by some device that introduces a phase-shifted magnetic field on one side of the rotor.

Task 1: Work in group to discuss about these details as said below:

1. What will happen if a poly-phase induction motor is disconnected one phase?
2. What will happen if a poly-phase induction motor is connected to single phase supply?
3. What is shaded pole motor. Give the applications.
4. The types of single-phase AC motors are depended on which feature?
5. Application of single phase motor?

Technical reading 2

Task 2 : Read the below passge then complete diagram as shown below:



The split phase motor achieves its starting capability by having two separate windings wound in the stator. The two windings are separated from each other. One winding is used only for starting and it is wound with a smaller wire size having higher electrical resistance than the main windings. From the rotor's point of view, this time delay coupled with the physical location of the starting winding produces a field that appears to rotate. The apparent rotation causes the motor to start. A centrifugal switch is used to disconnect the starting winding when the motor reaches approximately 75% of rated speed. The motor then continues to run on the basic of normal induction motor principles.

The phaseof magnetic field in this startup winding is shifted from the phase of the mains power, allowing the creation of a moving magnet field which starts the motor. Once the motor reaches near design operating speed, the centrifugal switch activates, opening the contacts and disconnecting the startup winding from the power source the motor then operates solely on the running winding. The startingwinding must be disconnected since it would increase the losses in the motor.

Technical reading 3

Capacitor – Start Motor

Capacitor start motors form the largest single grouping of general purpose single phase motors. These motors are available in a range of sizes from fractional through 3HP. The winding and centrifugal switch arrangment is very similar to that used in a split phase motor. The main difference being that the starting winding does not have to have high resistance. In the case of a capacitor start motor, a specialized capacitor is utilized in a series with the starting winding. The addition of this capacitor produces a slight time delay between the magnetization of starting poles and the running poles. Thus the appearance of a rotating field exists. When the motor approaches running speed, the startingswitch opens and the motor continues to run in the normal induction motor mode.

This moderately priced motor produces relatively high starting torque, 225 to 400% of full load torque. The capacitor start motor is ideally suited for hart loads such as conveyors, air compressors and refrigeration compressors. Due to its general overall desirable characteristics, it also is used for many applications where high starting torque may not be required. The capacitor start motor can usually be recognized by the bulbous protrusion on the frame where the starting capacitor is located.

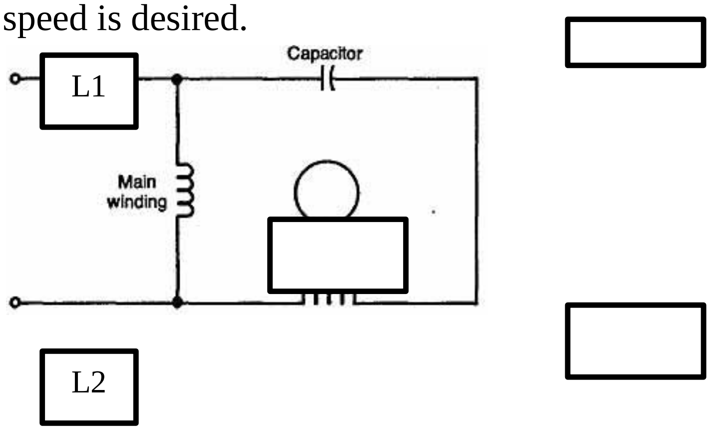
Task 3: True / False

1. The wining and centrifugal switch arrangment is very dissimilar to that used in a split phase motor.
2. The starting winding of capacitor start motors does not have to have high resistance
3. The capacitor is utilized in a series with the starting winding.
4. A slight time delay between the magnetization of starting poles and the main poles
5. When the motor approaches running speed, the starting switch opens and the motor discontinues to run in the normal induction motor mode.

Technical reading 4

Permanent –split capacitor motors

Another variation is the capacitor-start motor described above, but there is no centrifugal starting switch and the second winding is permanently connected to the power source. By changing taps on the running winding but keeping the load constant, the motor can be made to run at different speeds. The capacitor of this motor is left in series with the starting winding during normal operation. The starting torque is quite low, roughly 40% of full –load, so PSC motors are frequently used in air handlers, fans, and blowers and other cases where a variable speed is desired.



Task 4: Complete the diagram as shown above.

UNIT 7:

<u>Home appliances</u>

Tuning – up

Answer the questions:

1. ***Write the name of things?***
2. ***What functions are they?***

Technical reading 1.

Remote control

The remote control unit contains keys and electronic components similar to those of a calculator. The keys are connected byy a matrix of wires which cross beneath each individual key. Pressing a key completes an electrical circuit, and a signal is sent to a microchip which, in turn, sends a series of on- off electrical pulses to a light- emitting diode (LED) at the front of the handset. A code spelt out by the length and spacing of these pulesswithches on the LED. The LED flashes on and off to send an infra-red beam to the receiving “ eye” on the television set.

Task 1: Read the above passage and complete the gaps.

1. You press a key

2.

3. A signal is sent to a microchip

4.

5. These pules switch on the LED

6.

Technical reading 2

Video cassette recorder

The step from recording sound on magnetic tape to doing the same with video signals is one –inch wide tape and made the most of the available band width by moving the tape past the head at high speed.

Unfortunately, this meant that transport mechanism had to be built to a high specification. Improvements in magnetic tape and the use of helical scanning meant that far more data could be crammed into a smaller area. By spinning the head at a high speed, the rate at which the data could be stored or retrieved was increased. Aligning the head at an angle to the tape laid down the information as a series of slanted tracks. This allowed the cassette tape to be narrower and move at a slower speed, giving rise to the modern video cassette recorder.

Early VCRs were playback-only, but by building in a full- colour TV tuner, programmes could be recorded from the air white anotherchannel was being viewed on a normal TV. The inclusion of a timer meant that recordings could be made and viewed at a later date. Early timer only switched the tape on at a certain time, leaving the VCR running until the tape finished. The latest machines allow a large running of on/off programmed times to be set so that viwers can go on holiday and not miss a single episode of their favourite soap opera.

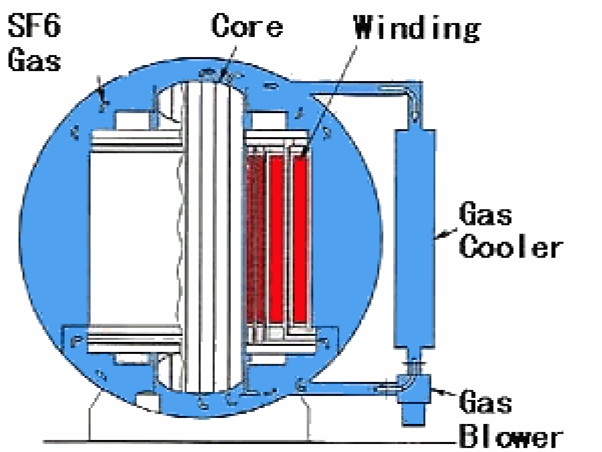
Task 2. Read the passage and match each change VCR design with its resul, as in the example below.

Design change	**Result**
Example : moving the tape past the head at the high speed	*The transport mechanism had to be built to high specification*.
1. Improvement in magnetic tape and the use of helical scanning	a. The information was laid down as a series of slated tracks.
2. Spinning the head at a high speed	b. The modern VCR could be produced.
3. Aligning the head at an angle to the tape	c. Far more data could be crammed into a smaller area.
4. Recording information in slanted tracks	d. Recordingscould be made and viewd at a later date.
5. All these improvements	e. The rate at which the data could be stored or retrieved was increase.
6. The inclusion of a timer	f. The cassette tape could be narrower and the tape could move at a slower speed.

UNIT 8:

TRANSFORMERS

Tuning – up



Answer the questions:

1. What is it?
2. Where can you see it?
3. Talk about it? (types, how work, functions….)

Technical reading 1.

A transformer is an electrical device that transfers energy from one circuit to another purely by magnetic coupling. Relative motion of the parts of the transformer is not required for tranfer of energy. Transformer are often used to convert between high and low voltages, to change impedance , and to provide electrical isolation between circuits.

The transformer is one of the simplest of electrical devices. Its basic design, materials, and princilpes have changed little over the last on hundred yearstranformer designs and materials continue to be improved. Transformer s aer essential in high voltage power transmission providing an economical means of transmitting power large didtances. The simplicity, reliability, and economy of conversion of voltages by transformers was the principle factor in the selection of alterlating current power transmission in the " War of Currents" in thelate 1880's. In electronic circuitry, new methods of circuit design have replaced some of the application of transformers, but electronic technology has also developed new transformer designs and applications.

Transformer alone cannot do the following:

- Convert DC to AC or vice vesa.
- Change the voltage or current of DC.
- Change the DC supply frequentcy.

However, transformers are components of the systems that perform all these functions.

Classification

Transformers are adapted to numerous engineering applications and may be classified in many ways:

- By power level (fromfraction of a watt to many megawatts),
- By application (power supply, impedance matching , circuit isolation)
- By frequency range (power, audio, RF)
- By voltage class (a few volts to about 750 lilovolts)
- By cooling type (air cooled, oil filled,fancooled,water cooled,…..)
- By ratio of the number of turn in the coils).

Task 1: Reading comprehension

1. What is a transformer?

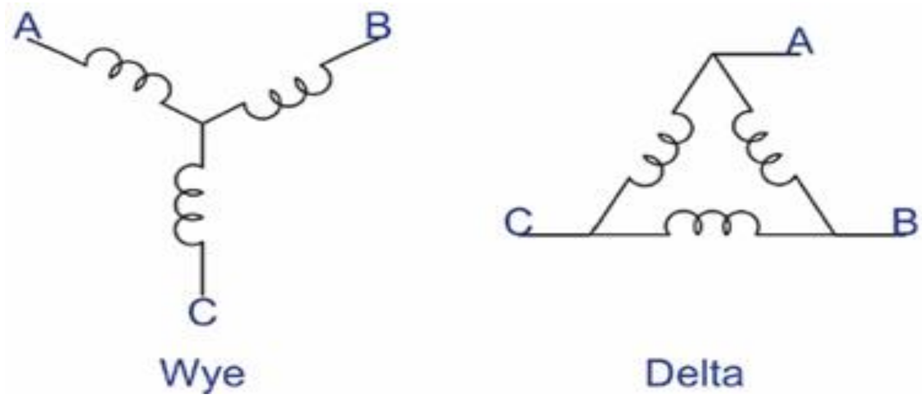
   ……………………………………………………………………………………………

2. How many ways can you classify a transformer? What?

   ……………………………………………………………………………………………

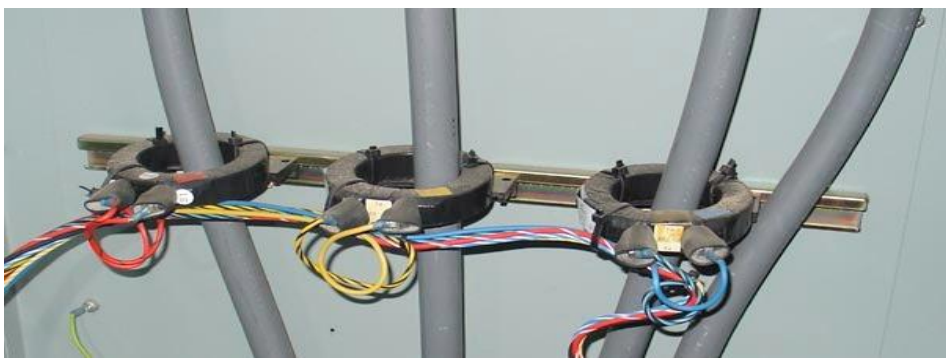
Technical reading 2

Polyphase transformer



For three- phase power, three separate single-phase transformers can be used, or all three phases can be connected to a single polyphase transformer. The three primary windings are connected together and the three secondary windings are connected together. The most common connections are Y- A, A-Y, and Y-Y.

Current transformers



Current transformer used as a part of metering equipment for three-phase 400 ampere electricity supply. A current transformer is designed to provide a current in its secondary which is accurately proportional to the current flowing in its primary.

Current transformers are commonly used in electricity meters to facilitate the measurement of large current is which would be difficult to measure more directly.

Care must be taken that the secondary of a current transformer is not disconnected from its load while current is flowing in the primary as in this circumstance a very high voltage would be produced across the secondary. Current transformers are often constructed with a single primary turn either as an insulated cable passing through a toroidalcore , or else as a bar to which circuit conductors are connected.

Task 2: Are these sentences true or false? Write T (true) or F (false). Then correct the false sentences.

1. Current trannsformer is a part of metering equipment.

2. Current trannsformer provides a current in its primary.
3. Current trannsformer facilitate the measure ment of small currents.
4. Current trannsformer are often constructed with a single secondary turn.
5. Current transformer is for three- phase power.

Grammar:

- **Article : a/ an**
- **Prepositions: up, of,with, into……**
- **Conjuctions:**
- **Passive voice:**
- **Prefix – suffix: in, dis, un…..-ful**
- **If clause – conditional sentences**:
  Type 1: The verb in the If clause is in the present tense. The verb in the main clause is in the future simple. It does not matter which comes first.
  Eg: if the swutch is on the circuit will be closed.
- **Word forms**:
  ADJ - NOUNNOUN - NOUN
  Eg: external – magnet servo - motor

TÀI LIỆU THAM KHẢO

[1] Mr Lee and Mr. Kick , *English Installation Practice*, II.Book Company , 2005.

[2] Nguyễn Thành Trí, *English for technical students,* Long Man Press , 2000.

[3] Jeremy Comfort, Steve Hick, Allan Savage , *Basic Technical English* Oxford University Press, 2005.

[4] John Eastwood, *Oxford Guide to English Grammar*, Oxford University Press, 2005.

[5] Sở Giáo Dục và Đào tạo Hà Nội, *Giáo Trình Tiếng Anh Chuyên Ngành Điện* , NXB Hà Nội, 2007.