Controlled and uncontrolled rectifier pdf

Circuits that are used to convert the Alternating Current (AC) input power into a Direct Current (DC) output power is known as rectifier circuits. Rectifiers are found in almost all equipment, from a low voltage battery charger to High Voltage DC transmission systems. Basically, rectifiers are classified into Controlled rectifiers and uncontrolled rectifiers. In controlled rectifiers, semiconductor switches such as thyristors, BJTs, MOSFETs, IGBT etc are used. The output parameters of a controlled rectifier can be easily controlled with the help of semiconductor switches. In this article only the uncontrolled rectifiers are discussed. As the name indicates these rectifiers cannot be controlled externally. Controlled rectifiers are made up of a few diodes and conditioning elements such as capacitors. Uncontrolled rectifiers can be classified as follows: Half wave rectifier Full wave rectifier Bridge rectifier. Of these three types of uncontrolled rectifiers, the most commonly used type is the bridge rectifier. Bridge rectifier is the most efficient of the three. So, let us discuss bridge rectifier first. The full wave bridge rectifier is shown in the circuit. A single phase full wave bridge rectifier consists of four diodes connected to form a closed loop called “bridge”. The output of the full wave bridge rectifier is same as that of ordinary full wave rectifier but the advantage is that it does not require center tapped transformer. Therefore the cost and the size of the circuit is reduced. Full wave bridge rectifier In a full wave bridge rectifier, two diodes will be conducting for each half cycle. The rest of the diodes will be reverse biased. During the positive half cycle of the supply, diodes D1 and D2 are forward biased and will be conducting. Diodes D3 and D4 are reverse biased and will not be conducting. Full wave bridge rectifier During the negative half cycle of the supply diodes, D3 and D4 are forward biased and will be conducting. Diodes D1 and D2 are reverse biased and will not be conducting.During both the half cycles the current flowing through the load is unidirectional. Hence the voltage developed across the load is also unidirectional. The output voltage contains voltage ripples that can be controlled by connecting a capacitor in parallel to the load. Full wave bridge rectifier The half wave rectifier consists of a single diode connected in series with the load. In half wave rectification, when a single-phase AC supply is connected to a half-wave rectifier, the diode passes only the positive half cycle of the supply and blocks the negative half cycle. As the rectifier passes only a half of the supply it is called a half wave rectifier. Half Wave Rectifier Circuit Half wave rectifier During each positive half cycle of the AC sine wave, the anode is positive with respect to the cathode. Hence the diode is forward biased. Under the forward biased condition, the diode acts like a closed switch resulting in current flowing through the diode. During each “negative” half cycle of the AC sine wave, the anode is negative with respect to the cathode. Hence the diode is reverse biased and acts as an open switch. No current flows through the diode or circuit. full wave rectifier The half wave rectifiers produce too much of ripples and the output current is not continuous. These drawbacks make it unsuited for many applications, especially in the circuits that require “steady and smooth” DC supply voltage. Ripples and efficiency can be improved using full wave rectifiers.In full wave rectifiers we can obtain output voltage during the positive and negative half cycles. Therefore it delivers improved efficiency than the half wave rectifiers. It produces an output voltage that is purely DC. For the full wave rectifiers the average direct current output voltage is higher than that of half wave, the output of the full wave rectifier has much less ripple than that of the half wave rectifier producing a smoother output waveform.In a single phase, Full Wave uncontrolled Rectifier circuit two diodes are now used. Only one diode will be forward biased and conducts during each half cycle. A centre tapped transformer is used in full wave rectifier as shown in the figure. Bridge rectifier with filter As mentioned earlier, the voltage ripples can be controlled by connecting a smoothing capacitor in parallel to the load. It converts the full wave rippled output of the rectifier into a smooth DC output voltage. But the usage of the capacitor is the circuit is limited by the cost factors and the size of the circuit. The smoothing capacitor controls the ripple as follows: Commonly used smoothing capacitors are of 100uF or higher of aluminium electrolytic type. The parameters considered during the selection of appropriate capacitance value are its working voltage and capacitance value, which determines the number of ripples that appear at the output. The direct voltage obtained after rectifications contains a certain amount of voltage ripples that can be reduced by using a large value of capacitance. For half-wave rectifiers, it is not necessary. This is because in half-wave rectifier will increase the ripple rather than reducing it. Half-wave rectifiers are not practically used in a circuit due to its reduced efficiency and more losses. Full wave rectifier with filter Rectifiers are widely used in all electronic equipment to provide dc supply from the available AC supply. Controlled rectifiers are used in the high voltage Direct current transmission system to convert the generated AC power into DC power for transmission. Also, it is used in battery charges, home inverters etc. Read more on diodes Types of Diodes(Click)A Diode is a two-terminal electronic component which offer zero resistance in forward bias and infinite resistance in reverse bias. This article tells about various types of diodes. It seems that phase-controlled rectifiers and ac voltage controllers willmaintain their presence in power electronics for years to come.From: Control in Power Electronics, 2002 I need short information. Best Answer The uncontrolled rectifier has only diodes but the controlled rectifier has SCR. The controlled rectifier needs a triggering circuit whereas the uncontrolled rectifier does not need a triggering circuit. In an uncontrolled rectifier, we can not control the output whereas, in a controlled rectifier, we can control the output. By varying the firing angle, we can change the output in a controlled rectifier and there is no firing or triggering concept in the uncontrolled rectifier. The cost of an uncontrolled rectifier is less compared to the cost of a controlled rectifier. Output can be smoothly controlled in a controlled rectifier. The time required to design a controlled rectifier is more compared to the time required to build an uncontrolled rectifier. Thank you for reading… Love you… In a controlled rectifier, we can control output by trigger SCR whereas, in uncontrolled rectifiers, diodes are used so we can’t control output. In a controlled rectifier, we can control output by trigger SCR whereas, in uncontrolled rectifiers, diodes are used so we can’t control output. The uncontrolled rectifier has only diodes but the controlled rectifier has SCR. The cost of an uncontrolled rectifier is less compared to the cost of a controlled rectifier. What are uncontrolled and controlled rectifier devices? For uncontrolled rectifier circuits, semiconductor diodes are the most commonly used device and are so arranged to create either a half-wave or a full-wave rectifier circuit. Why is it called uncontrolled rectifier? Circuits that are used to convert the Alternating Current (AC) input power into a Direct Current (DC) output power is known as rectifier circuits. In this article only the uncontrolled rectifiers are discussed. As the name indicates these rectifiers cannot be controlled externally. What is a full wave uncontrolled rectifier? A single-phase full-wave uncontrolled bridge rectifier is supplying a highly inductive load (L/R ratio is very large), the load current is assumed to be smooth and ripple –free. (b) The rms value of the output voltage Vorms and current Iorms . (c) The rms value of the diode current IDrms and the PRV of each diode. Which is better uncontrolled and controlled rectifier? 1. Uncontrolled Rectifiers : Provide a fixed d.c. output voltage for a given a.c. supply where diodes are used only. (a) Half-controlled : Allows electrical power flow from a.c. to d.c. (i.e. rectification only) . (b) Fully-controlled : Allows power flow in both directions (i.e. rectification and inversion). What are the applications of controlled rectifier? Applications of Phase Controlled Rectifier AC fed traction system using a DC traction motor. electro-metallurgical and Electrochemical processes. Reactor controls. Magnet power supplies. Portable hand instrument drives. Flexible speed industrial drives. Battery charges. High voltage DC transmission. What is meant by controlled rectifier? A controlled rectifier is a circuit that is used for converting AC supply into unidirectional DC supply & can control the power fed to the load. This process of converting alternating current (AC) to direct current (DC) is also called as controlled rectification. What is the purpose of a rectifier? A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. What are the advantages of controlled rectifier? To compensate the DC line voltage variations caused by voltage variations on the medium voltage power network. To keep voltage constant even in case of load variations. To control the fault current on faults far from the electrical substation and consequently to increase line protection settings. What are the different types of controlled rectifier? Controlled Rectifier: Half Wave Controlled Rectifier. Full Wave Controlled Rectifier. Controlled Bridge Rectifier. Controlled Center-Tap Rectifier: What is the function of controlled rectifier? The control of low power dc motors is another interesting application of controlled single-phase rectifiers. In the circuit of Fig. 11.13, the controlled rectifier regulates the armature voltage and consequently controls the motor current id in order to produce a required torque. FIGURE 11.13. What is rectifier and how it works? A rectifier is a device that converts an oscillating two-directional alternating current (AC) into a single-directional direct current (DC). The simplest rectifiers, called half-wave rectifiers, work by eliminating one side of the AC, thereby only allowing one direction of current to pass through. What is the drawback of controlled rectifier? Drawbacks of SCR It can conduct only in one direction. So it can control power only during one half cycle of ac. It can turn on accidentally due to high dv/dt of the source voltage. It is not easy to turn off the conducting SCR. What is the major drawback of controlled rectifier? The SCR (silicon controlled rectifier) is unidirectional devices, so it can control power only in DC power during positive half cycle of AC supply, thus only DC power is controlled with the help of SCR. The gate current cannot be negative. In AC circuit, it needs to be turned on each cycle. What is called controlled rectifier? The diodes are termed as uncontrolled rectifiers as they conduct (during forward bias condition without any control) whenever the anode voltage of the diode is greater than cathode voltage. Hence, the thyristor is also called as controlled rectifier or silicon controlled rectifier. What is the function of a rectifier? A rectifier is a device that converts an oscillating two-directional alternating current (AC) into a single-directional direct current (DC). Rectifiers can take a wide variety of physical forms, from vacuum tube diodes and crystal radio receivers to modern silicon-based designs. Why is a rectifier used? A rectifier is used for powering appliances Using a rectifier in the power supply helps in converting AC to DC power supply. Bridge rectifiers are widely used for large appliances, where they are capable of converting high AC voltage to low DC voltage. Related

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