A thyristor is switched off and no current

AThyristor is a type of diode that allows current to flow if and only if acontrol voltage is applied to its gate terminal. This kind of diode has threeelectrodes namely anode, cathode and gate. The symbol of thyristor is shown inFigure 1. Figure 1: Thyristor Symbol and P-N JunctionsThyristors havedifferent working principle depending on its classification.

Generally, the thyristor is switched off and no current flows between theanode and the cathode when there is no current flowing into the gate. On theother hand, when there is a flow of current into the gate, it effectively flowsinto the base of the n-p-n transistor, which makes the thyristor operates. Figure 2: The circuit and its V-I CharacteristicsFigure 2 shows therepresentation of the circuit (a) used to obtain the V-I Characteristics (b). Some of the significant points on this characteristic talks about the HoldingCurrent, Latching Current, Reverse Current, and Forward Break-Over Voltage. Latching Current (IL) is the amount of the anode current required toconstantly maintain the operation of a thyristor immediately after turning iton. On the other hand, Holding Current (IH) is the current requiredto maintain a thyristor into its on-state. In order for us to turn off a thyristor, the forward anode current must be less than compared to its IH in a particularperiod of time.

If it is not maintained properly, the thyristor will not returnto its state of blocking when the voltage across anode-to-cathode increasesagain. In other words, if there is no IG applied externally, thereis a chance or possibility to return to its conducting state. Reverse Current(IR) will only be present and conduct through a device if and onlyif it is in a reverse-biased condition. Mostof the time, current flows once the circuit is in a forward-biased condition. However, there are instances that there is a presence of a reverse current thatconducts in a reverse-biased condition. Once the thyristor isturned on by a gate signal and its anode current is greater than the holdingcurrent, the device continues to conduct due to positive feedback even if thegate signal is removed. This is because the thyristor is a latching device andit has been latched to the on-state. Relaxation Oscillatorcan be constructed through UJT.

UJT or Unijunction Transistor is a break-overtype transistor. It consists of 3 terminals namely Base 1, Base 2 and Emitter. UJTis said to be a transistor but it has a different characteristics, propertiesand operation compared to conventional BJT or FET because it is only used as a switchunlike to some transistors such as BJT and FET, it also allows the input signalto be amplified. Waveform generators, thyristor gate control, timers and of oscillatorsare some of its application. UJT is used in a relaxation oscillator because ifyou’re going to see its characteristics, it has a negative resistance region whichcan be easily used and employed in relaxation oscillator. As technology is keepon improving and developing, PUT has been invented. PUT stands for ProgrammableUnijunction Transistor.

From the word itself, its structure and operation isthe same as UJT. It is said to be programmable because it can be adjusted to adesired VP through external resistance and its intrinsic standoffratio. Figure 3: PUT Relaxation Oscillator Figure 4: Waveform across the capacitor in a PUT Relaxation OscillatorFigure 3 shows thePUT Relaxation Oscillator. ? (intrinsic standoff ratio) and VP(Peak Voltage) are all dependent with Resistor 1 and Resistor 2. The resistor connected in the cathode terminalof the transistor limits the cathode current flowing in PUT. When VBB (Supply Voltage) is supplied, the capacitor starts doing its function to charge. Given the condition when thevoltage across the capacitor is greater than the given VP, PUT conductsinto its negative resistance and creates a low resistance path from theterminal of the transistor which makes the capacitor discharges.

Once thevoltage across the capacitor is less than VV (Valley Point Voltage), the PUT comes back to its initial. Again, the capacitor starts to charge withthe help of the resistor and the cycle is repeated. A sawtooth waveform is theoutput when a series of the cycle is applied which is shown in Figure 4.