QUIZ-1:

Q1. Define semiconductor diode?

Ans: A diode made of semiconductor components, usually silicon. The cathode, which is negatively charged and has an excess of electrons, is placed adjacent to the anode, which has an inherently positive charge, carrying an excess of holes.

Q2. Define depletion layer?

Ans: A region in a semiconductor device, usually at the juncture of P-type and N-type materials, in which there is neither an excess of electrons nor of holes. Large depletion regions inhibit current flow.

Q3. what do you mean by forward biased?

Ans: When the p-type side of the diode is connected to a higher potential than the n-type side, the diode is said to be forward biased, because it enhances the capability of the diode to conduct forward current.
External voltage is applied across the p-n junction in the same polarity as the p- and n-type materials.

Q4. what do you mean by reverse biased?

Ans: When the case is opposite and n-type side is kept at a higher potential than the p-type side, only a small amount of reverse saturation current flows through the diode, referring this condition as reverse biased.
External voltage is applied across the p-n junction in the opposite polarity of the p- and n-type materials.

Q5. Define Knee voltage?

Ans: The forward voltage at which the flow of current during the PN Junction begins increasing quickly is known as knee voltage/cut-in voltage.

Q6. Define breakdown voltage?

Ans: breakdown voltage is the minimum reverse voltage that makes the diode conduct appreciably in reverse.

Q7. Define max. Forward current?

Ans: The Maximum value of the forward current that a PN junction or diode can carry without damaging the device is called its Maximum Forward Current.

Q8. Define max. Power rating?

Ans: The power rating of equipment is the highest power input allowed to flow through particular equipment. The Maximum Power Rating is defined as the maximum power that a PN junction or diode can dissipate without damaging the device itself.

Q9. What is ideal diode?
Ans: An ideal PN junction Diode is a two terminal polarity sensitive device that has zero resistance (diode conducts) when it is forward biased and infinite resistance (diode doesn't conduct) when it is reverse biased.

Q10. What are the application of PN diodes?
Ans: 1. Rectifiers in DC power supply, 2. Switch in digital circuits, 3. Clamping, Clipping circuits network used in TV Receiver, 4. Demodulation (detector) circuits.5. P-N junction forward bias condition is used in all LED lighting applications.

QUIZ-2:

Q1. Define Full wave rectifier?
Ans: A full wave rectifier is a type of rectifier which converts both half cycles of the AC signal into pulsating DC signal.

Q2. Which are different types of Full Wave rectifier?
Ans: two types: center tapped full wave rectifier and full wave bridge rectifier.

Q3. How many numbers of diodes are used in full wave rectifier?
Ans:4 in bridge rectifier 2 in center tapped rectifier

Q4. Give disadvantage of canter-tap wave rectifier?
Ans: The PIV (peak inverse voltage) of a diode used twice that of the diode used in the half wave rectifier, so the diodes used must have high PIV.

It is expensive to manufacture a center tapped transformer which produces equal voltage on each half of the secondary windings.

The output voltage is half of the secondary voltage, as each diode utilizes only one half of the transformer secondary voltage.

Q5. Write ripple factor for FW rectifier?
Ans: 0.48

Q6. What is the efficiency of FW rectifier?
Ans: The maximum efficiency of a Full Wave Rectifier is 81.2%.

Q7. Write advantages of bridge rectifier?
Ans: The rectification efficiency of a full-wave rectifier is double of that of a half-wave rectifier. The higher output voltage, higher output power and higher Transformer Utilization Factor in case of a full-wave rectifier.

The ripple voltage is low and of higher frequency, in case of full-wave rectifier so simple filtering circuit is required

No center tap is required in the transformer secondary so in case of a bridge rectifier, the transformer required is simpler. If stepping up or stepping down of voltage is not required, the transformer can be eliminated even.

For a given power output, power transformer of smaller size can be used in case of the bridge rectifier because the current in both primary and secondary windings of the supply transformer flow for the entire ac cycle

Q8. Write one feature of Full wave rectifier?

Ans: Rectifier Efficiency: Rectifier efficiency is defined as the ratio of DC output power to the AC input power.

Rectifier efficiency indicates how efficiently the rectifier converts AC into DC. A high percentage of rectifier efficiency indicates a good rectifier while a low percentage of rectifier efficiency indicates an inefficient rectifier. η=Output(PDC)/Input(PAC).The rectifier efficiency of a full wave rectifier is 81.2%. The rectifier efficiency of a full wave rectifier is twice that of the half wave rectifier. So, the full wave rectifier is more efficient than a half wave rectifier.

Q9. Define Transformer Utilization Factor?

Ans: The transformer utilization factor of a rectifier circuit is defined as the ratio of the DC power available at the load resistor to the VA/AC rating of the secondary coil of a transformer. TRANSFORMER utilization factor for half wave rectifier is .287 or .3.

Q.10 Write the equation for DC current?

Ans: V=IR

QUIZ-3:

Q1. What is filter?

Ans: Electronic filters are a type of signal processing filter in the form of electrical circuits. Electronic filters remove unwanted frequency components from the applied signal, enhance wanted ones, or both.

Q2. Give commonly used filters?

Ans: The most common types of electronic filters are linear filters. Linear filters process time-varying input signals to produce output signals, subject to the constraint of linearity.

Q3. What is the equation of dc output voltage?

Ans: Vdc=0.636Vm Vdc=0.318Vm

Q4. When we can use inductor as a filter?

Ans: The filter is a device that allows passing the dc component of the load and blocks the ac component of the rectifier output. The filter circuit can be constructed by the combination of components like capacitors, resistors, and inductors. Inductor is used for its property that it allows only dc components to pass and blocks ac signals.

Q5. What happens when the filter capacitor value larger?

Ans: The job of the capacitor in the output filter of a DC power supply is to maintain a constant DC value by removing as much power ripple as possible. Because these capacitors have a DC value, they are actually storing a lot of energy that never gets used. Typically, a large filter capacitor is used to absorb and store energy when the AC power is higher than what is needed by the DC load and to supply energy to the load when the AC power is lower than what is needed.

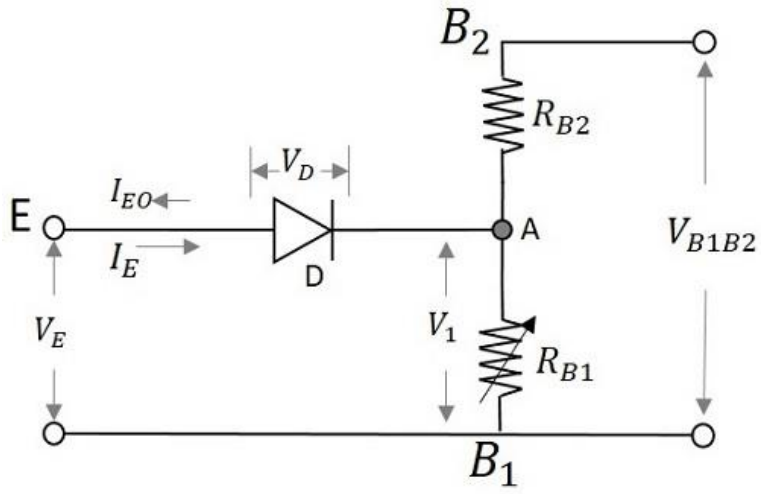
EXP-4

Questions (UJT):

1.What is an UJT and draw its equivalent circuit?

Ans: A unijunction transistor is a three-lead electronic semiconductor device with only one junction that acts exclusively as an electrically controlled switch.

Equivalent circuit:



2. Why is an UJT used in SCR firing circuit?

Ans: One typical application of the unijunction transistor circuit is to generate a series of pulses to fire and control a thyristor. By using the UJT as a phase control triggering circuit in conjunction with an SCR or Triac, we can adjust the speed of a universal AC or DC motor as shown.

3. Why is the isolation needed between Thyristor and firing circuit?

Ans: In thyristor converters high ac voltages exists between anode and cathode of the thyristor, while low voltage level pulses are placed between gate and cathode. Isolation is necessary between the gate-cathode circuit and the anode-cathode Circuit so that unwanted short-circuits between devices are avoided..

4. How is a pulse transformer different from other transformer?

Ans: The pulse transformers can operate at high frequencies, and can transfer more power as compared to a normal transformer of the same size. Pulse transformers are widely used for low power circuits, high power switched mode power supplies, and signal transmission.
A transformer that is enhanced to produce electrical pulses with high velocity, as well as stable amplitude, is known as a pulse transformer.

5. What are the features of pulse transformer?

Ans: Main features of a pulse transformer are the following ones:

- **n** primary to secondary turns ratio
- **Vt** minimum voltage*time area (called transfer area) that can be transferred at the secondary side with unipolar pulse, without causing the core saturation, referred to the temperature of 25°C
- $\mathbf{L_P}$ primary winding inductance
- $\mathbf{C_k}$ coupling capacity between windings
- $\mathbf{L_s}$ primary leakage inductance, it is the inductance value measured at the primary side, with the secondary winding short-circuited
- $\mathbf{R_P}$ primary winding resistance
- $\mathbf{R_S}$ secondary winding resistance
- $\mathbf{t_r}$ rise time, it is the time that takes to transfer the pulse when the rated load resistance is connected at the secondary side; this value is tightly connected to the leakage inductance value
- $\mathbf{I_{max}}$ maximum secondary current, available with a rise time equal to tr (rated load resistance connected to the secondary winding)
- $\mathbf{I_p}$ rated primary effective current (thermal current)
- $\mathbf{f_n}$ rated working frequency (or optimum frequency range)
- $\mathbf{U_{is}}$ maximum working voltage between two windings
- $\mathbf{U_p}$ isolation voltage between two windings

6. What are the advantages of using pulse transformer?

Ans: **1. Ability to Transfer High Energy:** High energy can be transferred efficiently with short rise-time and wide pulse-width in a pulse transformer.
2. More Windings: With more than two windings, pulse transformers utilize several transistors at the same time.
3. Prevents Stray Currents: Pulse transformers have galvanic isolation between the windings, which prevents the passing of stray currents.

4. Provides Insulation and Control: Abrasive resins in pulse transformers help control electric resistance or any vibrations inside the transformer with a process known as vacuum potting, which comprises thermo-setting plastics or silicone rubber gel.

7. What is a firing circuit?
Ans: The triggering circuit is one of the key areas of thyristor or SCR circuit design - ensuring that the silicon controlled rectifier triggers only when required is key.

8. What is the load used?
Ans: An electrical load is an electrical component or portion of a circuit that consumes (active) electric power.

9.What is meant by ramp control, open loop control or manual control with respect to UJT firing circuit?
Ans: Capacitor *C* Charges through *R* until it reaches the UJT trigger voltage V_p. The UJT then turns "on" and *C* discharges through the UJT emitter and primary of the pulse- transformer. The windings of the pulse transformer have pulse voltages at their secondary terminals. Pulses at the two secondary windings feed the same inphase pulse to two SCRs of a full wave circuit. SCR with positive anode voltage would turn ON. Rate of rise of capacitor voltage can be controlled by varying *R*. The firing angle can be controlled up to about 150°. This method of controlling the output power by varying charging resistor *R* is called as ramp control, open loop control or manual control.

10. What is time constant of a circuit?
Ans: The RC time constant, also called tau, the time constant (in seconds) of an RC circuit, is equal to the product of the circuit resistance (in ohms) and the circuit capacitance (in farads). It is the time required to charge the capacitor, through the resistor.

12. What are the merits of UJT firing circuit over RC triggering circuit?
Ans: UJT circuits used along with the timing RC circuits are used where timing is necessary or where at least 2 waveforms -one a sawtooth waveform with a fast falling edge and a second one with a sharp spike for triggering some other circuit at the exact time point are necessary.

These requirements are simultaneously met directly by using a single UJT firing circuit which is a relaxation oscillator. It can also be synchronized with external signals like the line frequency, a big advantage. Such applications occur in Power Electronic, in firing SCRs and triacs and also in some CRO circuits as vertical oscillators.

Whereas a single RC triggering circuit is just a simple basic circuit needing input from other circuit for its working.

13. What are the advantages of UJT pulse trigger circuit?
Ans: We can get a stable triggering voltage is we use a UJT pulse trigger circuit.

14. What is relaxation oscillator? Why is UJT used as relaxation oscillator?
Ans: A relaxation oscillator is a nonlinear electronic oscillator circuit that produces a non-sinusoidal repetitive output signal, such as a triangle wave or square wave. The UJT relaxation oscillator is called so because the timing interval is set up by the charging of a capacitor and the timing interval is ceased by the rapid discharge of the same capacitor.

15. What are the applications of UJT trigger circuits?
Ans: The most common application of a unijunction transistor is as a triggering device for SCR's and Triacs but other UJT applications include sawtoothed generators, simple oscillators, phase control, and timing circuits.

16. What is valley voltage?
Ans: As the diode gets forward biased, the voltage across it will be 0.7v. So, this is constant and V_{B1} goes on decreasing. Hence V_E goes on decreasing. It decreases to a least value which may be denoted V_V called as Valley voltage.

17. What is the discharging path of the capacitor?
Ans: The capacitor discharges through the UJT emitter and primary of the pulse-transformer.

~~**18. Draw the static characteristics of UJT.**~~

19. What is negative resistance?
Ans: Negative resistance in a Unijunction Transistor (UJT) is the part of the device's operating region where emitter current increases as emitter voltage decreases. This is the inverse of what happens with conventional resistance, where increasing current through the resistance causes a linear corresponding increase in the voltage across it (by Ohm's law, R = E/I). Follows is the static-emitter transfer characteristic of a UJT. The region between (Ip, Vp) and Iv, Vv) is where the device effectively acts like a negative resistance.

20. What is interring base resistance?
Ans: The bulk resistance between the two bases, which will be different for different types of UJT.

21. What is intrinsic standoff ratio?
Ans: It is the ratio of RB1 to the sum of RB1 and RB2. It can be expressed as $\eta = RB1/(RB1+RB2)$ or $\eta = RB1/R_{BBO}$. The typical range of intrinsic standoff ratio is from 0.4 to 0.8.

22. What is the width of the triggering pulse?
Ans: The time *t*, equal to α/ω, when the pulse is applied to SCR for the first time, will remain constant for the same value of *R*. So, the width of the triggering pulse is α/ω.

Questions (Controlled Rectifier):

1.What is a full controlled rectifier?

Ans: Phase controlled rectification uses combinations of diodes and thyristors (SCR's) to convert the AC input voltage into a controlled DC output voltage. Fully-controlled rectifiers use four thyristors in their configuration, whereas half-controlled rectifiers use a combination of both thyristors and diodes.

2. What is a semi converter?

Ans: **Semi converter**: In the same circuit, 2 *thyristors* and 2 *diodes* are used. We can control the voltage during only one halfcycle when the thyristors are in forward bias state. The other half cycle it works like a normal full wave converter.

3. What is a dual converter?

Ans: In a dual converter, two converters are connected together back to back.
One of the bridge works as a rectifier (converts AC to DC), another half bridge works as an inverter (converts DC to AC) and connected commonly to a DC load. Here two conversion processes take place simultaneously, so it is called as a dual converter.

4. How can we control the output voltage of a single-phase full converter?

Ans: The output voltage can be controlled by the firing angle alpha.

5. How many lines are there in single-phase system?

Ans: There are two lines in a single phase system.

6. What is the type of commutation used?

Ans: The type of commutation used is natural commutation or line commutation. Natural Commutation of SCR is the process of turning off an SCR without using additional commutation circuitry.

7. What is rectification mode and inversion mode?

Ans: The process through which the AC voltage of the electrical power is converted into a direct (constant) voltage waveform (DC. voltage) or into a pulsating waveform with a direct (DC) component is called **rectification**

Inversion mode is where the output dc link voltage is negative since the DC link current has to remain positive, the power sent out to the DC link is negative, that means you are actually sending power back to the ac source from the dc link.

8. Where is full bridge converter used?

Ans: The full bridge converter can be used in the charger of an electric vehicle. It can also be used in the bidirectional converter of renewable energy sources like wind turbines.

9. What is the effect of adding freewheeling diode?

Ans: It reduces the harmonics and it also reduces sparking and arching across the mechanical switch so that it reduces the voltage spike seen in a inductive load.

10. Why the brightness of the bulb varies with the variation of the resistance?

Ans: The variation of the resistance varies the charging time of the capacitor which is why the brightness of the bulb changes.