



IQRA NATIONAL UNIVERSITY
Phase II, Hayatabad Peshawar

Student: Hayat Ahmad Khan

ID# 14486

Dept: BS(CS)

paper: Basic electronics

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Q1:- part (b)

Ans:-

The Third approximation does the technician normally used when performing initial troubleshooting procedures because technician usually satisfies the following equation.

$$\text{Ignore bulk: } RB < 0.01R_M$$

This says to ignore the bulk resistance when it is less than 1/100 of Thevenin resistance facing the diode. when this condition is satisfied the error is less than 1-percent.

Q1:- part (c)

Ans:- The reason for using Thevenin circuit are;

(a) The voltage across the load terminals when the load resistor is open is called thevenin voltage V_{th} . Because of this, the Thevenin voltage is sometimes called the open-circuit voltage. As a definition

$$\text{Thevenin voltage: } V_{th} = V_{oc}$$



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(b) The resistance that an ohmmeter measures across the load terminals when all sources are reduced to zero and the load resistor is open.

Thevenin resistance: $R_{Th} = R_{oc}$

⇒ The reasons for using a Norton circuit are;

(a) The load current when the load resistor is shorted is called Norton current. Because of this, the Norton current is sometimes called short-circuit current

Norton current: $I_N = I_{sc}$

(b) The resistance that an ohmmeter measures across the load terminals when all sources are reduced to zero and the load resistor is open is called Norton resistance.

Norton resistance: $R_N = R_{oc}$



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Student: Hafiz Ahmad Khan

ID# 14486

Dept: Bs(CS)

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Q23 - part (a)

Ans:- The effect of transformer turn ratio on the output voltage of full-wave rectifier

- * In one turn ratio the rectified peak voltage equal to the half value of input voltage at the primary side (minus) the voltage across a potential barrier.
- * Due to double voltage at secondary side, half value of voltage will appear across the half part of the secondary winding and equal to the V_{pri} .
- * To minimize the voltage drop across the potential barrier and to make an output voltage peak equal to the input voltage peak we used transformer having turn ratio 2.
- * If the number of turns in primary windings and secondary winding is equal then the turn ratio of a transformer will be one.



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Student: Hayat ammad Khan
Dept: Bs (CS)

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Q2:- part (b)

Ans:-

Center tapped rectifier:-

- * Center tapped rectifier as the name suggest is requires a center tapped transformer (secondary winding).
- * The peak inverse voltage (PIV) of diode in center tapped full wave rectifier is twice the transformer secondary terminal voltage.
- * Center tapped rectifier uses only two diodes in its circuit.
- * Voltage drop across the two diodes of center tapped rectifier is less when compared to bridge rectifier.

Bridge rectifier:-

- No center tapped transformer is required in bridge rectifier.
- * Peak inverse voltage (PIV) of diode is equal to the transformer secondary voltage. Thus this type of rectifier can be used for high voltage application.
 - * Bridge rectifier uses four diodes in its circuit.
 - * The voltage drop across the 4 diodes of bridge rectifier is more than the voltage drop across center tapped rectifier.



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Q2: part (c)

Ans:-

Advantages of RC filter:-

RC filter allows the peak value of the rectified signal to pass through the load resistor. The resistor R is much greater than the X_C at the ripple frequency. Therefore the ripple is reduced before it reaches the load. Typically R is 10 times larger than X_C . Therefore at each section attenuates the ripple by a factor of 10.

Disadvantages of RC filter:-

The disadvantages of an RC filter are the loss of voltage across each R . Because of this, the RC filter is suitable only for very light loads (small load current or large load resistance).



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Advantages of LC filter :-

* The choke input (LC)

filter has a high D.C voltage.

- * It has no loading effect on the rectifier and power transformer.
- * The diode does not have to carry surge currents.
- * It has a very low ripple factor as compared to series inductor filter and shunt capacitor filter.
- * It has very good load regulation.

Disadvantages of LC filter :-

- * It cannot be used together with half wave rectifier.
- * Due to inductor it produces the audible noise.
- * It is not useful for very low load currents.
- * There is a loss of power in the series inductor due to its D.C resistance.
- * It has low output D.C voltage than that of π type filter.



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ID# 14486

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Q3 :- Part (a)

The extremely small current exist in reverse biased diode because current is caused by the minority carriers in the (n) and (p) regions that are produced by thermally generated electrons-hole pairs. The small number of free minority electrons in the (p) region are "pushed" toward the (pn) junction by the negative bias voltage.

when these electron reach the wide depletion region, they "fall down the energy hill" and combined with the minority holes in the n region as valance electrons and flow towards the positive bias voltage, creating a small hole current.



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ID# 14486

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Part (B) :-

Light emitting diodes produce light by movement of electrons between the two terminals of diode, which occurs by a process called electroluminescence. When a light emitting diode is electrically connected, electrons start moving at the junction of the N-type and P-type semiconductor within the diode. When there is a jump over of electrons at p-n junction, the electron loses a portion of its energy. In regular diodes this energy loss is in the form of heat. However, in LEDs the specific type of N and P conductors produce photons (light) instead of heat. The amount of energy lost defines the color of light produced.



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ID# 14486

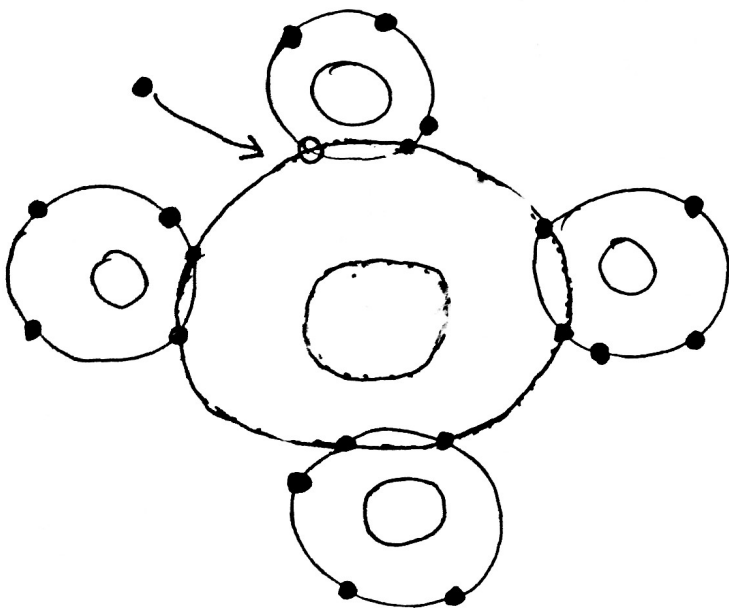
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Part - (c) :-

In a pure silicon crystal, the thermal energy creates an equal number of free electrons and holes. The free electrons move randomly throughout the crystal. Occasionally, a free electron will approach a hole, feel its attraction and fall into it. This is known as recombination. Because of this recombination energy is released.



Recombination of free electron and a hole:



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Part - (d) :-

Carrier recombination are processes by which mobile charge carriers (electrons and electron holes) are created and eliminated. Carrier generation and recombination process are fundamental to the operation of many optoelectronic semiconductor devices, such as photodiodes, light-emitting diodes and laser diodes. They are also critical to a full analysis of p-n junction devices such as bipolar junction transistors and p-n junction diodes.

Part - (E) :-

Surface - leakage current :-

Besides the thermally produced minority-carrier current, does any other current exist in a reverse-biased diode? Yes. A small current flows on the surface of the crystal. Known as the surface-leakage current, it is caused by surface impurities and imperfections in the crystal structure.