University of Sargodha

BS 1st Term Exam 2017

Subject: CS/SE/IT **Course: Basic Electronics (PHY-2210)**

Time Allowed: 2:30 Hours **Maximum Marks: 80**

Objective Part Compulsory

Q.No.1: Attempt all parts and each require answer 2 – 3 lines (16*2=32)

1) What is the first ionization energy of an electron in hydrogen atom?

The first ionization energy of an electron in hydrogen atom is 2.18×10^{-18} joule (13.6 electron volts).

2) What is the avalanche Breakdown in reverse biased P-N Junction?

When reverse current is applied to the PN Junction, the minority charge carriers (electrons in P-type and holes in N-type) gain large kinetic energy. They collide with the valence electrons of the atom and tries to release them. In this process covalent bonds are broken and pairs of electrons and holes are generated. As a result, number of electrons and holes increases. This is called avalanche break down. This type of break down happens in lightly doped junction and a wide depletion layer.

3) Define threshold voltage. Give its value for Si and Ge Junction?

Threshold voltage means the minimum voltage required to activate any active components. It is mainly due to the semiconductor diodes used in them. Si has 0.7v and Ge has 0.3v threshold voltage.

4) Why Collector-Base Junction is always reverse biased?

5) Which factors control the capacitance of capacitor?

Capacitance of capacitor depends upon the following factors:

- Plate Area: Less plate area gives less capacitance and large plate area give more capacitance.
- Plate Spacing: Less space between plates gives more capacitance and further plate spacing give less capacitance.
- Dielectric Material: The greater permittivity of the dielectric gives greater capacitance and less permittivity of the dielectric gives less capacitance.

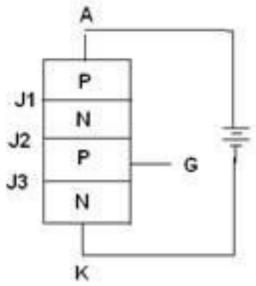
6) What is the basic principle behind the propagation of light in optical fiber?

Total Internal Reflection is the basic principal behind the propagation of light in optical fiber. There are two essential requirements for Total Internal Reflection to happen, Light should go from denser to rarer medium and Angle of incidence should be greater than critical angle

7) Write down two examples of nonlinear resistor?

Thermistor and Photo resistors are the types of nonlinear resistors. Thermistor works on temperature, if heat increases, the resistance decreases and vice versa. In photo resistors as light increases resistance decreases and vice versa.

8) Define Silicon Controlled Rectifier (SCR)?

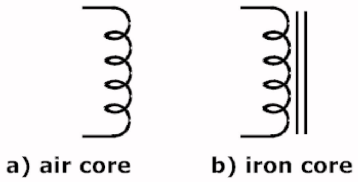


A silicon-controlled rectifier or semiconductor-controlled rectifier is a four-layer solid-state current-controlling device. Which forms PNPN or NPNP structure, it has tree junction J1. J2 and J3 and three terminals. The anode terminal of SCR is connected to the P-type and cathode is connected to the N-type. The gate is connected to the P-type material near to the cathode.

9) Why electrons have greater mobility than holes in semiconductor material?

The free electrons move faster than holes because they are already in the conduction band means they have reached certain energy for them to be highly excited than of holes which are majority located at the valence band.

10) Draw symbols of an air-core and iron-core inductor?



11) Why we use series voltage dividers circuits?

A voltage divider is a simple circuit which turns a large voltage into a smaller one. Using just two series resistors and an input voltage, we can create an output voltage that is a fraction of the input. Voltage dividers are one of the most fundamental circuits in electronics.

12) Why base is kept narrow in the manufacturing of a transistor?

Emitter is meant for emitting the Charge Carrier (hole or electron) and the charge carrier emitted by Emitter passes through Base & reaches Collector. Base is meant for passing the charge carrier from emitter to collector involving no special activities, hence it's the smallest region.

13) Why pure semiconductors are insulators at 0^o K?

In semiconductors, at 0k, electrons do not have sufficient energy to jump from valance band to conduction band and therefore it acts as an insulator. As the temperature increases, electrons get energy to pass from valance band to conduction band making it to conduct.

14) What is the effect of doping level on width of depletion layer?

Doping means adding impurities to the semiconductor to improve its electrical conductivity. When we add large amount of impurities to the semiconductor, it will produce large number of free electrons in the n-type semiconductor and large number of holes in the p-type semiconductor.

The large number of free electrons in the n-type semiconductor repels from each other and try to move towards p-side. However, before entering into p-side, the free electrons meet positive ions at the depletion region. We know that positive ions are ready to accept extra electrons. When the positive ions accept the extra electrons, they become neutral atoms. In this manner large number of free electrons fills the holes in positive ions and makes them neutral.

In the similar way, holes moving from p-side to n-side meets the negative ions and makes them neutral atoms. In this manner, free electrons and holes reduce the ions. Reduction of positive ions means reduction of depletion region. Thus, the depletion region decreases.

15) Why Silicon is invariably used in the manufacture of junction photodiodes?

16) Define Silicon controlled Rectifier with its symbolical representation?

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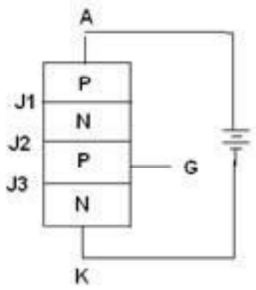

Subjective Part (4x12 = 48)

Q2. Write note on the following.

(a) Chassis Ground

(b) Cells in series and parallel connections

Q3(a). Classify the magnetic materials on the basis of their magnetic properties.

(b) What is the capacitance of a parallel plate capacitor of plate area 0.01m2 and air dielectric f thickness 0.01m? If the capacitor is given a charge of 500μμC, what will be the potential difference between the plates? How will be affected if space between the two plates is filled with wax which has a relative permittivity of 4?

Q4. Draw the transistor equivalent model of SCR, with the help of tills model, explain the working of SCR also mention its application.

Q5. Define Integrated Circuit? Write a note on Drawbacks of ICs.

Q6. Define and explain Half Wave Voltage doubler with the help of circuit diagram.

Q7. Define solar cell. Explain its construction and working with circuit diagram.