University of Sargodha

BS 1st Term Examination 2019

Subject: CS/IT/SE **Paper: Basic Electronics (PHY-2219)**

Maximum Marks: 80

Time Allowed: 2:30 Hours

Note: Objective part is compulsory. Attempt any three questions from subjective part.

Objective Part (Compulsory) (2*16)

Q.1 Write short answers of the following in 2-3 lines each.

(i) Define a linear resistor? Draw its V-I curve?
(ii) Why electrons have greater mobility than holes in a semiconductor material?
(iii) What is the effect of doping on width of depletion layer?
(iv) Draw schematic energy band diagram of a P-type extrinsic semiconductor?
(v) What is Zener breakdown in reverse biased P-N junction?
(vi) Do pure semiconductors obey ohms law?
(vii) Draw symbols of an air-core and an iron-core inductor.
(viii) Why optical fibres are better than metallic wires?
(ix) What are thermally generated charge carriers?
(x) In a transistor why emitter is heavily doped? and collector is lightly doped.
(xi) Describe a circuit which provides continuously varying potentials?
(xii) Differentiate between primary and secondary cells.
(xiii) Define capacitance of a capacitor and its unit.
(xiv) What should be the features of outside protection provided to an optical fiber?
(xv) Ten resistors each having resistance 10 ohm are connected in parallel. What is their equivalent resistance?
(xvi) What is LED?

Subjective Part (16*3)

Q.2. (a) How P-N junction diode is forward and reverse biased? Draw VI characteristic curve for PN junction diode
(b) What are intrinsic semiconductors? What is their behaviour at 0K and at room temperature (i.e 300K) What is their response to electric field

Q.3. (a) What is photomultiplier tube? Write theory involved in photomultiplier tube.
(b) A 12 volt battery of negligible internal resistance is connected across a parallel combination of 4K, 6K and 12K resistors. Compute
i) Combined circuit resistance ii) Current supplied by the battery
iii) Power supplied by the battery

Q.4. (a) What is rectification? Which characteristic of a diode is used in rectification? Explain its types.
(b) How pulsating dc can be converted in to pure dc by using an inductor filter?

Q.5. (a) Define modulation, Demodulation and carrier wave? There are how many methods of Modulation? Why frequency modulation is advantageous as compared to amplitude modulation?
(b) Explain structure of an optical fibre with the help of a diagram.

Q.6 (a) What is a transformer? How it works (core type transformer)? what is voltage transformation ratio? What is condition for ideal transformer?
(b) A power transformer has 100 primary turns and 600 secondary turns. If primary voltage is 120 volt and full load primary current is I_1 Amp, find secondary voltage V_2 and Secondary current I_2

Subject: Software Engineering Paper: Basic Electronics (Phy-2219)

Time Allowed: 2:30 Hours Maximum Marks: 80

Note: Objective part is compulsory. Attempt any four questions from subjective parts

Objective Part

Q. 1 Write short answers of the following questions in 2-3 lines only (16 x 2 = 32)

1. Define current proportional formula
2. Differentiate transition capacitance and diffusion capacitance?
3. Prove that $\beta = \frac{\alpha}{1-\alpha}$
4. Why PIN Photodiodes have faster response than even the P-N Photodiode?
5. Why we need filters in the electronics circuits?
6. What is effect of temperature on barrier voltage?
7. Why electrons have greater mobility than holes in a semiconductor material?
8. Give at least three applications of p-n junction photodiode
9. Write down the significance of inductor, how it respond to a.c?
10. Distinguish between drift speed and Fermi speed?
11. Explain effect of doping on semiconductor
12. In an optical fibre why refractive index of core is kept higher than cladding?
13. Under what condition a transistor can operate in active region
14. Define Solar cell? Draw its symbol
15. What are carrier waves?
16. What is Amplitude modulation?

Subjective Part (4 x 12 = 48)

Q. 2 a) Discuss capacitive effects exhibited by P-N junction when they are forward or reverse biased?

(b) The current flowing into base of transistor is 200 μA. Find the collector current and emitter current if β=100

Q.3 (a) Explain Amplitude modulation in detail?

(b) Two capacitors of 0.0003μF and 0.0006μF are connected in series. Find their combined series and parallel capacitance.

Q. 4 (a). Define parallel circuit? Explain characteristics of a parallel resistive circuit?

(b). From fig 1. Find

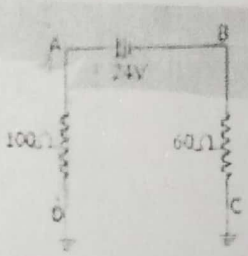


Fig 1

(i) Circuit current

(ii) Potential of point B

(iii) Value of Lowest Potential

Q. 5 What is an Operational Amplifier. Discuss it in detail

Q. 6 Draw a NPN Transistor circuit in common Base configuration and discuss its input, output characteristics.

Q. 7 Write a note on Shunt capacitor Filter and series Inductor Filter

University of Sargodha

BS 1st Term Examination 2018

Subject: CS / IT / SE
Paper: Basic Electronics (PHY-2210)
Time Allowed: 2:30 Hour
Maximum Marks: 80

Note: Objective part is compulsory. Attempt any three questions from subjective part.

Objective Part

Q1. Write Short answer of the following on your answer sheet. (2*16=32)

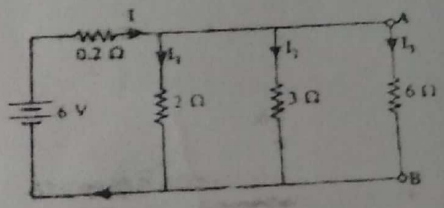
A. Define rectification? Name its types?
B. Write the causes of Fiber losses?
C. Can a transformer operate on DC?
D. Define dielectric strength of a medium?
E. What is Zener breakdown?
F. What are passive circuit elements?
G. What is the important feature of parallel circuits over series circuit?
H. Find resistance value and tolerance rate of blue-white-gold-silver?
I. What is the effect of temperature on barrier voltage?
J. What are draw backs of ICS?
K. What is ideal diode?
L. Differentiate between linear and non-linear devices?
M. What is the effect of doping on width of depletion layer?
N. Why is Silicon preferred to Germanium for semi-conductor devices?
O. What is the behavior of semi-conductor at zero degree Kelvin?
P. Do pure semi-conductors obey Ohm's law?

Subjective: (3 * 16=48)

Q2. a). Describe the working of a potentiometer.

b) find the values of following questions with respect to given diagram

I. Branch currents.
II. Current and power supplied by the battery
III. Current and power supplied by the battery if an accidental short occurs between points A and B.



Q3. a. Define transformer? Give principal and working of core type transformer?

b. A power transformer has 100 primary turns and 600 secondary turns. If the primary voltage is 120 Volt and full load primary current is 12 A. Find secondary voltage and secondary current?

Q4. Explain input and output characteristics of NPN transistor in CB configuration?

Q5. a. Define rectification? Explain half wave rectification with the help of single diode?

b. What is light emitting diode? Give its construction and working?

Q6. Define Fiber Optics? What is the structure of Optical Fibers? Also define the classification of Optical Fiber?

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University of Sargodha

BS 1st Term Exam 2015

Subject: Computer Science **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 Zero reference level? Why we need it during voltage measurements at different point in electric circuit?

The Zero reference level or the common point is considered to be of zero potential and all other circuit voltages weather positive or negative, are measured with respect to this Common or Zero Reference Level.

2) Differentiate between transition capacitance and diffusion capacitance?

Transition capacitance: When P-N junction is reverse biased the depletion, region act as an insulator or as a dielectric medium and the p-type an N-type region have low resistance and act as the plates. This junction capacitance is called as space charge capacitance or transition capacitance and is denoted as CT. Since reverse bias causes the majority charge carriers to move away from the junction, so the thickness of the depletion region denoted as W increases with the increase in reverse bias voltage.

Diffusion capacitance: When the junction is forward biased, a capacitance comes into play, which is known as diffusion capacitance denoted as CD. It is much greater than the transition capacitance. During forward biased the potential barrier is reduced. The charge carriers move away from the junction and recombine. The density of the charge carriers is high near the junction and reduces or decays as the distance increases. Thus, in this case charge is stored on both side of the junction and varies with the applied potential. So as per definition change in charge with respect to applied voltage results in capacitance which here is called as diffusion capacitance.

3) Why PIN photodiodes have faster response than even the PN photodiode?

PIN photodiode is a three region reverse biased junction diode. A layer of intrinsic silicon is sandwiched between two heavily doped P and N type silicon materials. This has a effect of reducing the transit time of photo induced electron hole pairs. Hence, PIN photodiodes have faster response even than PN photodiode.

4) Why we need filters in electronic circuits?

Electronic circuits used to perform signal processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones, or both. Their purpose is:

- To select the desire frequency (or band of frequencies) from a complex input waves.
- To reject the undesired frequency (or band of frequencies).
- To apply only the desired frequency component to the circuit where it is required.

5) Which factors control the capacitance of a capacitor?

Capacitance of capacitor depends upon the following factors:

- Plate Area: Less plate area give 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) The color of light emitted by LED depends on what?

The material used in the semiconducting element of an LED determines its color. The two main types of LEDs presently used for lighting systems are aluminum gallium indium phosphide (AlGaInP, sometimes rearranged as AlInGaP) alloys for red, orange and yellow LEDs; and indium gallium nitride (InGaN) alloys for green, blue and white LEDs. Slight changes in the composition of these alloys changes the color of the emitted light.

- GaAs - infrared radiation (invisible light)

Solved by Talha Shahab

- GaP - red or green light
- GaAsP - red or yellow (amber) light

7) What is effect of temperature on barrier voltage?

Barrier voltage (V_b) depends on doping density, electronic charge and temperature. With increase in temperature, more minority charge carriers are produced leading to the increased drift across junction. As a result, equilibrium occurs at a slightly lower barrier potential.

8) Why electrons have greater mobility than holes in semiconductor materials?

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.

9) Distinguish between drift speed and Fermi speed?

Drift Velocity: The drift velocity is the average velocity that a particle, such as an electron, attains in a material due to an electric field. In general, the average velocity gained by the free electrons of a conductor, with which the electrons get drifted under the influence of an electric field, applied externally across the conductor.

Fermi Velocity: The Fermi energy is a concept in quantum mechanics usually referring to the energy difference between the highest and lowest occupied single-particle states in a quantum system of non-interacting fermions at absolute zero temperature.

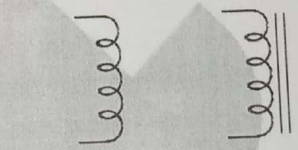
10) Explain the effect of doping on semiconductor?

When we add impurities to semiconductors we call them dopants and the process is called doping. Doping can have effect on semiconductor improving conductivity of semiconductors, like silicon and making p-type to n-type semiconductors.

11) In an optical fiber why refractive index of core is kept higher than cladding?

Refractive index of core is kept higher than cladding to refract light back to the cladding. This is the classical arrangement of full reflection of light propagating inside core as it reaches the boundary with the cladding. If the cladding had about the same or higher refractive index then light would reach the cladding and could escape outside.

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



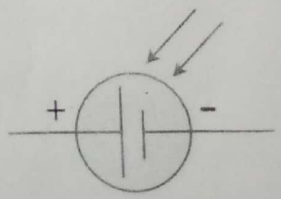
a) air core b) iron core

13) Under what condition a transistor can operate in active region?

The transistor is in said to be in active region if when base voltage increases but base to collector voltage is still negative.

14) Define solar cell? Define its symbol?

A solar cell or photovoltaic cell (previously termed "solar battery"), is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon. Its symbol is as follows:



15) What are carrier waves?

A high-frequency electromagnetic wave modulated in amplitude or frequency to convey a signal is called carrier wave. We use carrier waves in telecommunication to transfer data or information.

16) What is amplitude modulation?

The modulation of a wave in which its amplitude changes but its frequency remains same then the resultant wave is called amplitude modulation (AM). In generally, the modulation of a wave by varying its amplitude, used especially as a means of broadcasting an audio signal by combining it with a radio carrier wave.

Subjective Part (4*12)

Q2. **(a)** Define inductor. Explain Mutual Inductance in detail.
(b) Calculate the inductive reactance offered by a coil of inductance 250pH to radio frequency currents of frequencies (i) 1 MHz (ii) 10MHz

Q3. **(a)** Define series circuit? Explain characteristics of a series resistive circuit?
(b) A 12V battery of negligible internal resistance is connected across a parallel combination of4K, 6K, and 12K resistors. Compute:
(i) Combined circuit resistance
(ii) Current supplied by the battery
(iii). Power supplied by the battery

Q4. **(a)** What is Transformer? Explain principle, construction, working of Transformer
(b) A power transformer has 100 primary turns and 600 secondary turns. If primary voltage is 120V and full load primary current is 12A, Find secondary (i) Voltage V2 (ii) current I2

Q5. What is P-N Junction? Explain Forward and Reverse Voltage Current Characteristics of a P-N Junction.

Q6. **(a)** Explain Transistor biasing for the proper working of a PNP and NPN transistor
(b) Following readings are obtained in transistor circuit of CB Configuration.

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University of Sargodha

BS 3rd Term Examination 2014

Subject: Information Technology **Paper: Basic Electronics (NSC-101)**

Time Allowed: 2:30 Hours **Session: 2012-16** **Maximum Marks: 80**

Note: Objective part is compulsory. Attempt any four questions from subjective part.

Objective Part (Compulsory)

(2*16)

Q.1. Write short answers of the following.

1. On what factors conductivity of a material depends, why semiconductors have high resistance than conductors?
2. How many different mobile carriers participate in conduction process, in semi conductors and insulators?
3. What is the origin of minority carriers in p-type and n-type materials?
4. Describe briefly, how many different currents flow in pn junction diode?
5. Why a full wave rectifier is better than half wave rectifier?
6. Draw the circuit diagram of full wave (centre tape) rectifier.
7. Explain the significance of clippers.
8. Discuss at least three applications of zener diode.
9. Draw a circuit diagram that shows how a zener diode is biased also draw its characteristic curve
10. Define ripple factor, find □ when peak ripple voltage $V_{r\text{-}peak} = 1v$, $V_{dc} = 20v$
11. How many different types of BJTs are available, draw their symbols and pin names?
12. Draw the circuit diagram of base bias, enlist various currents flowing in the transistor.
13. Why stability of Q-point is the key feature in amplification circuits?
14. Briefly describe the conditions that should be met for a transistor to act as a switch.
15. Write three differences between BJT and MosFET.
16. What is DAC?

Subjective Part (12 x 4 = 48)

Q.2. What is pn junction diode? Explain its construction, forward bias, reverse bias, and draw their respective graphs

Q.3. a) What is rectifier? Explain the construction working of full wave bridge rectifier (6)

b) What are positive clampers? Draw circuit diagram and explain its working. (6)

Q.4. Recall D.C biasing find the values of I_c, I_B, V_{CE} for Emitter feedback bias circuit, also draw load line

Q.5. What are different classes of amplifiers, explain the working of class B amplifier

Q.6 [illegible] efficiency of class A amplifier is 25%

Q.7. a) What are MosFETs, thoroughly discuss their construction and working (8)

b) What is ADC, why computer need this device (4)

University of Sargodha

BS 1st Term Exam 2016

Subject: Information Technology **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) Express voltage proportional formula for two resistances connected in series?

The voltage across each resistor connected in series follows different rules to that of the series current.

$V_{Total} = V_1 + V_2 + V_3 \ldots\ldots + V_n$ and

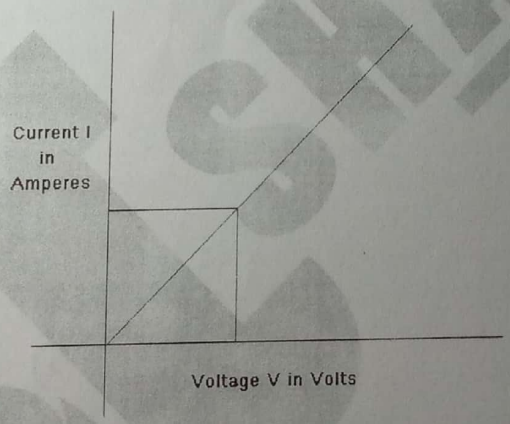
$V_1 = IR_1$, $V_2 = IR_2$ $V_n = IR_n$

2) Why we need filters in electronic circuits?

Electronic circuits used to perform signal processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones, or both. Their purpose is:

- To select the desire frequency (or band of frequencies) from a complex input 0000000wave.
- To reject the undesired frequency (or band of frequencies).
- To apply only the desired frequency component to the circuit where it is required.

3) How Ohm's law can be expressed graphically for linear resistors?



4) Briefly describe total internal reflection.

Total internal reflection, in physics, complete reflection of a ray of light within a medium such as water or glass from the surrounding surfaces back into the medium. The phenomenon occurs if the angle of incidence is greater than a certain limiting angle, called the critical angle. In general, total internal reflection takes place at the boundary between two transparent media when a ray of light in a medium of higher index of refraction approaches the other medium at an angle of incidence greater than the critical angle. For a water-air surface the critical angle is 48.5°.

5) Can a transformer operate on DC?

NO, transformers cannot operate on DC. Transformers work in the principle of Faraday's law of "mutual induction", in which an EMF is induced in the transformers secondary coil by the magnetic flux generated by the voltages and currents flowing in the primary coil winding.

As in DC (voltage being always constant) the change in flux is zero so no mutual induction, thus transformers can't work with a DC supply. Moreover, if DC of similar rating of AC (Voltage & Current) is fed into the terminals of a Transformer there is a high possibility that it would burn the primary coil.

6) What is the difference between electron and hole?

Electron: The subatomic particle having a negative charge and orbiting the nucleus; the flow of electrons in a conductor constitutes

Hole: hole is a hollow spot in a surface. An electron hole is just the lack of an electron, not an antiparticle... or a particle at all.

7) Why we use cells in series and parallel connection?

Cells are used in series combination when higher voltage is required. Because the total voltage in series circuit is sum of all voltages of cells. And cells are used in parallel connection when higher current is required instead of voltage.

8) Mention at least five different energy sources?

i. Solar Energy
ii. Wind Energy
iii. Geothermal Energy
iv. Hydrogen Energy
v. Tidal Energy
vi. Wave Energy
vii. Hydroelectric Energy
viii. Biomass Energy

9) Give two application of transformers.

I. To step up and step down the voltage level in Electric transmission, distribution. Voltage Regulator: This can easily be seen at your home for over voltage protection.
II. Welding Machine: Transformer reduces the voltage level and increases the Current in welding process. It converts 230 V AC, to 17–45 V AC and 55–590 Amp high current.
III. Rectification: The rectification process does AC to DC conversion. Rectification is important for HVDC transmission. The most common type of rectifier is your mobile charger.

10) Briefly describe how electrons are multiplied in photomultiplier tube?

Photomultipliers are extremely sensitive detectors of light including visible light, ultraviolet light and near infrared. Photons enter the photomultiplier tube and strike the photocathode. When this occurs, electrons are produced as a result of the photoelectric effect.

Once the electrons have been generated, they are directed towards an area of the photomultiplier called the electron multiplier. As the name suggests, this area serves to increase or multiply the number of electrons by a process known as secondary emission.

This operates by pulling electrons progressively towards the more positive areas in the following way. The electrons leave the photocathode with the energy received from the incoming photon. They move towards the first dynode and they are accelerated by the electric field and they arrive with much greater energy than they left the cathode. When they strike the first dynode more low energy electrons are released, and these are in turn attracted by the greater positive field of the next dynode, and these electrons are similarly accelerated by the greater positive potential of the second dynode, and this process is repeated along all the dynodes until the electrons reach the anode where they are collected.

11) Why optical fibers are better than metallic wires?

i. Greater Bandwidth: Copper cables were originally designed for voice transmission and have a limited bandwidth. Fiber optic cables provide more bandwidth for carrying more data than copper cables of the same diameter.
ii. Faster Speeds: Fiber optic cables have a core that carries light to transmit data
iii. Longer Distances: Fiber optic cables can carry signals much farther than the typical 328-foot limitation for copper cables.

iv. **Better Reliability:** Fiber is immune to temperature changes, severe weather and moisture, all of which can hamper the connectivity of copper cable. Plus, fiber does not carry electric current, so it's not bothered by electromagnetic interference (EMI) that can interrupt data transmission

v. **Thinner and Sturdier:** Compared to copper cables, fiber optic cables are thinner and lighter in weight. Fiber can withstand more pull pressure than copper and is less prone to damage and breakage.

12) Differentiate mobile charge carriers and immobile ions.

Mobile charge carriers: A charge carrier is a particle free to move, carrying an electric charge, especially the particles that carry electric charges in electrical conductors. Examples are electrons, ions and holes.

Immobile ions: Immobile ions are those particles which does not have the ability to move.

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

(Higher the doping the thinner will be 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.

14) On what facts inductance of an inductor depends?

Inductance of an inductor depends upon the following:

I. Number of wire wraps, or "turns" in the coil: the more turns in coil causes more inductance.

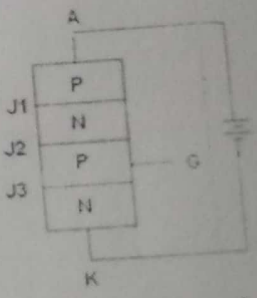
II. Coil area: greater coil area results in greater inductance; less coil area results in less inductance.

III. Coil length: the longer the coil's length, the less inductance; the shorter the coil's length, the greater the inductance.

IV. Core material: a core material with greater magnetic permeability results in greater inductance.

15) Define silicon-controlled rectifier with its symbolic representation?

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.



16) Define ripple factor.

The output of a rectifier is consisting of a dc component and an ac component. This ac component is undesirable and cause for the pulsations in the rectifier output.

The ripple factor is a measure of the quality of the rectification of an AC current. Ripple factor (γ) may be defined as the ratio of the root mean square (rms) value of the ripple voltage to the absolute value of the DC component of the output voltage, usually expressed as a percentage. However, ripple voltage is also commonly expressed as the peak-to-peak value.

Subjective Part (4x12=48)

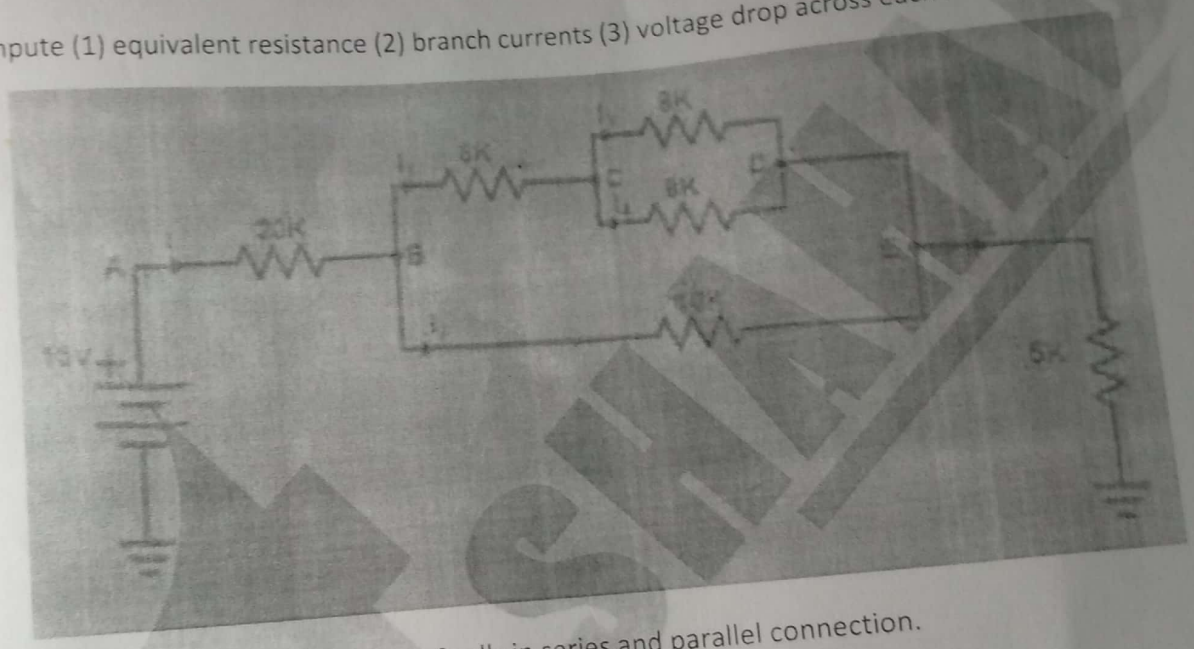
Q2. Define modulation? Explain frequency modulation in detail.

Q3. What is rectifier? Draw circuit diagram of full wave bridge rectifier and explain its working.

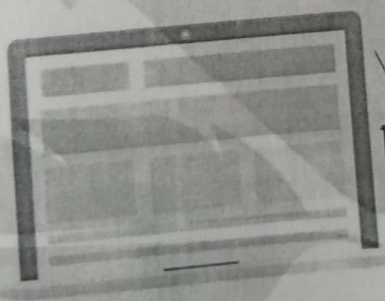
Q4. Draw and explain the forward and reverse characteristics curve of PN-Junction diode; discuss this on graph V_{br} (barrier voltage) and V_{sat} (saturation current).

Q5. Draw the transistor and equivalent model of SCR, with the help of this model, explain the working of SCR also mention its application.

Q6. Compute (1) equivalent resistance (2) branch currents (3) voltage drop across each resistance.



Q7. Write a note on the characteristics of cells in series and parallel connection.



University of Sargodha

BS 1st Term Exam 2017

Course: Basic Electronics (PHY-2210)

Subject: CS/SE/IT

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?

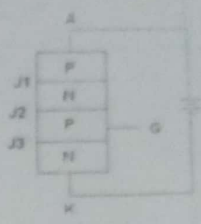
Total Internal Reflection is the basic principal behind the propagation of light in optical fiber. There are two essential requirements for Total Internal Reflection to happen, Light should go from denser to rarer medium and Angle of incidence should be greater than critical angle

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)?

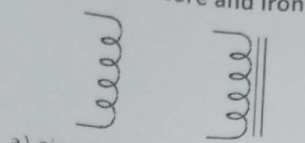
A silicon-controlled rectifier or semiconductor-controlled rectifier is a four-layer solid-state current-controlling device. Which forms PNPN or NPNP structure, it has tree junction J1. J2 and J3 and three terminals. The anode terminal of SCR is connected to the P-type and cathode is connected to the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



a) air core b) iron core

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° 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.

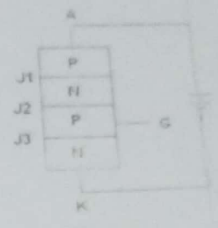
The large number of free electrons in the n-type semiconductor repels from each other and try to move towards p-side. However, before entering into p-side, the free electrons meet positive ions at the depletion region. We know that positive ions are ready to accept extra electrons. When the positive 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?

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.



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.