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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION JAN-2023

Course Code: ECE 1001

Date: 28-JAN-2023

Course Name: Elements of Electronics Engineering

Time: 09:30AM to 12:30 PM

Programme : B. Tech

Max Marks: 100

Weightage: 50%

Instructions:

- (i) ***Read Questions carefully and answer accordingly***
- (ii) ***Scientific and Non- programmable calculators are permitted***

PART A (Memory Recall Questions)

Answer all the questions. Each question carries SIX Marks.

[10Q x 3M = 30M]

1. The capacitor increases the DC voltage and decreases the ripple voltage components of the output. Therefore, for a half wave rectifier with capacitor filter and full wave filter with capacitor filter the charging time and discharging time are represented by T_1 , T_2 respectively. Identify the relation between Charging and discharging time?
 - a. Half wave Rectifier: $T_2 \gg T_1$ and Full Wave Rectifier: $T_2 = T_1$
 - b. Half wave Rectifier: $T_2 = T_1$ and Full Wave Rectifier: $T_2 \gg T_1$
 - c. Half wave Rectifier: $T_2 \gg T_1$ and Full Wave Rectifier: $T_1 = T_2/4$
 - d. Half wave Rectifier: $T_2 = T_1/4$ and Full Wave Rectifier: $T_2 \gg T_1$

2. Efficiency of rectifier is defined as the ratio of output power to the input AC power. The rectifier efficiency determines how effectively the rectifier converts Alternating Current (AC) into Direct Current (DC). Hence, efficiency of full wave rectifier:
 - a) 81.2%
 - b) 50%
 - c) 40.6%
 - d) 45.3%

3. Modulation process of varying amplitude of a periodic waveform, called the carrier signal, along with a modulating signal that typically contains information to be transmitted is named as?
 - a) Frequency Modulation
 - b) Amplitude Modulation
 - c) Phase Modulation
 - d) All of the above

4. The communication system is a system model that describes a communication exchange between two stations, transmitter, and receiver. Transducer is important block of Communication Systems. Identify the function of input transducer?

- (a) Converting other form of information to electrical form
- (b) Converting electrical signal to other form
- (c) Both of the above
- (d) None of above

(CO.3) [B. Level: Knowledge]

5. Logic gates are the basic building blocks of any digital system. It is an electronic circuit having one or more than one input and only one output. Identify the gate whose output goes High if only any one of the inputs are high?

- a) And Gate
- b) OR gate
- c) XOR gate
- d) Both a and c

6. Doping is a process of adding impurities in a pure semiconductor material. Depending upon the impurities added the semiconductor materials are classified as N-Type and P-Type Semiconductor Material. Name the impurity added in N-Type material?

- (a) Arsenic
- (b) Gallium
- (c) Boron
- (d) Silicon

(CO.1) [B. Level: Knowledge]

7. A BJT is a current controlled Device because its output characteristics are determined by the input current. In a transistor, the current equation is given by:

- (a) $I_E = I_B - I_C$
- (b) $I_E = I_B + I_C$
- (c) $I_B = I_E + I_C$
- (d) $I_C = I_E + I_B$

8. Logic gates are electronic circuit having one or more than one input and only one output. The number of NAND gates required to realize the AND gate?

- i) 3
- b) 2
- c) 4
- d) None of the above

(CO.3) [B. Level: Knowledge]

9. A microprocessor is a computer processor where the data processing logic and control is included on a single integrated circuit, or a small number of integrated circuits. The 8086 microprocessor has

- a) 8-bit Data Bus and 16- address Bus
- b) 8-bit Data Bus and 8- address Bus
- c) 16-bit Data Bus and 20- address Bus
- d) None of the above

(CO.4) [B. Level: Knowledge]

10. Complements are used in performing binary subtraction in Arithmetic and logic units. Identify the Two's complement of 1000101?

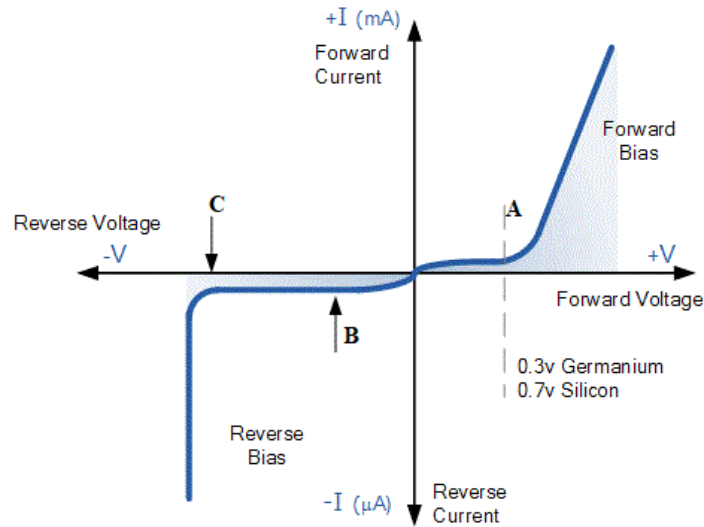
- a) 0111011
- (b) 1000110
- (c) 0111010
- (d) None of Above

(CO.3) [B. Level: Knowledge]

PART B (Thought Provoking Questions)

Answer all the Questions. Each Question carries TWENTY Marks. [2Q x 20M = 40M]

11. A diode is a two terminal semiconductor device, P-N junction diode is formed by combining the N-Type and P-Type material together and providing the leads to connect external biasing. The figure below represents PN junction diode characteristics. Refer the figure and answer the following questions:



- In forward bias condition, at point A, value of silicon diode and Germanium diode is 0.7V and 0.3V respectively. Identify and define Point A? (4 M)
- In reverse bias condition, point B represents very low value of current, how the current is measured in reverse bias condition? (4 M)
(a) μ Amperes (b) n Amperes (c) Amperes (d) Both (a) & (b)
- For above PN Junction diode if forward current is given as 3 mA and forward voltage is given as 6 V calculate the static resistance of Diode? (6 M)
- Identify and define Point B and C and also Define and when they occur in PN junction Diode? (6 M)

(CO.1) [B. Level: Comprehension]

12. A microprocessor is a controlling unit of a micro-computer, fabricated on a small chip capable of performing Arithmetic Logical Unit (ALU) operations and communicating with the other devices connected to it. 8085 is an 8-bit microprocessor designed by Intel in 1977 using NMOS technology.

The architecture of 8085 microprocessor provides the idea about what are the operations to be executed and how these are performed like Storing data, executing arithmetic and logic operations and also instructions.

- Draw the neat Sketch of 8086 Microprocessor? (10M)
- Identify and Differentiate between the General Purpose and Special Purpose registers available in 8086 Microprocessor? (5M)
- List some real time applications of Microprocessor? (5M)

(CO.4) [B. Level: Comprehension]

PART C (Problem Solving Questions)

Answer all the Questions. Each Question carries FIFTEEN Marks.

[2Q x 15M = 30M]

13. a) DeMorgan's Theorem states that inverting the output of any gate results in same function as opposite type of gate (AND vs. OR) with two inverted variables. It is used to solve Boolean Algebra expressions. DeMorgan's first theorem states that two (or more) variables NOR'ed together is the same as the two variables inverted (Complement) and AND'ed, while the second theorem states that two (or more) variables NAND'ed together is the same as the two terms inverted (Complement) and OR'ed. It performs gate operation like NAND gate and NOR gate.

Consider two Boolean Variables A, B and C and verify the two Demorgan's theorems using the truth table?

i) $(A+B+C)' = A' \cdot B' \cdot C'$

ii) $(ABC)' = A' + B' + C'$

b) PN-Junction diode is a two terminal semiconductor device that is used for allowing current flow in one direction. They are created by doping or ion implantation process. PN junction diode can be used as a rectifier, logic gate, voltage stabilizer, switching device etc. As BJT is a device in which two PN-diodes are connected back-to-back, which is widely used for amplification purpose in Common – Emitter configuration. Henceforth, illustrate the working of a PN-Junction diode in Forward and Reverse Bias Conditions with relevant diagrams. Illustrate with relevant diagrams the Input and Output Characteristics of Common Emitter configuration.

(C.O.No.1) [Comprehension]

14. a) Logic gates are the basic building blocks of any digital system. It is an electronic circuit having one or more than one input and only one output. The relationship between the input and the output is based on a certain logic. A universal gate is a gate which can implement any Boolean function without need to use any other gate type. The NAND and NOR gates are universal gates. In practice, this is advantageous since NAND and NOR gates are economical and easier to fabricate and are the basic gates used in all IC digital logic families. If A and B are inputs applied to logic gates and output is denoted with Y then, realize the following expressions using NAND gate?

i) $Y = A'$

ii) $Y = A * B$

iii) $Y = A + B$

iv) $Y = AB' + A'B$

v) $Y = A'B' + AB$

b) A number system is a system representing numbers. It is also called the system of numeration and it defines a set of values to represent a quantity. Perform the following calculations in binary

i) $(15)_{10} + (8)_{10}$

ii) Convert $(1100101010101)_2$ to Hexadecimal

iii) Give the two's complement of $(23)_{10}$

iv) Convert $(16)_{16}$ to Binary

v) If one's complement of a Number is 10101010 find the original number in decimal and also the two's complement of the given one's complement value.

(C.O.NO.3) [B.Level: Comprehension]