ANALOG AND DIGITAL ELECTRONICS

BRANCH:- EE /EEE

SEMESTER – THIRD

These important questions have been prepared using your previous exam papers (PYQs), verified concepts, and additional reference from trusted online academic sources.
For deeper understanding, please refer to your class notes as well.

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1️⃣ HIGH & LONG IMPORTANT QUESTIONS

Analog Electronics

1. **Diode & Regulator:**
   - Explain the construction, working principle, and **V-I characteristics of a PN junction diode**. Discuss the significance of the **Knee Voltage (or Cut-in Voltage)**.
   - Explain the reverse bias characteristics of a **Zener diode**. Draw a circuit diagram and explain how it is used as a **shunt voltage regulator**.

2. **Rectifiers & Power Supply:**
   - Explain the working of a **Centre-Tapped Full Wave Rectifier** with a neat circuit diagram and input/output waveforms. Derive the expressions for **Efficiency** (eta) and **Ripple Factor** (gamma).
   - Explain the need for **Transistor Biasing**. Describe the working of a **Voltage Divider Bias** circuit and explain its importance in thermal stabilization.

3. **BJT/FET:**
   - Explain the construction and working of an NPN/PNP transistor in the **Common Emitter (CE) configuration**. Draw and explain its **output characteristics**.

Digital Electronics

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4. **Boolean Algebra & Simplification:**
   - **State and prove De Morgan's Theorems**. Use Boolean Algebra rules/laws to **simplify the given complex Boolean expressions**.
   - Explain the working of a **Karnaugh Map (K-Map)**. **Simplify a given Boolean expression** (up to 3 or 4 variables) using a K-Map and draw the final simplified logic circuit diagram.

5. **Combinational Circuits (Adders):**
   - Explain the operation of a **Half Adder** and a **Full Adder** with their respective truth tables. Draw their logic diagrams using only **basic logic gates** (AND, OR, NOT).

6. **Sequential Circuits (Flip-Flop):**
   - Explain the working principle of a **JK Flip-Flop** with the help of a logic diagram and a truth table. Explain how the **Race Around Condition** is eliminated, typically using a **Master-Slave JK Flip-Flop**.

7. **Number System (Numerical Focus):**
   - Perform the following **number conversions**: Binary <> Decimal, **Decimal<>Hexadecimal**, and Hexadecimal<>Decimal.
   - Perform **Binary subtraction** using the **2's complement method**.

8. State and prove De Morgan's theorem. (PYQ)

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2 IMPORTANT & SHORT QUESTIONS

1. Define **Trivalent** and **Pentavalent** impurities. Differentiate between **Intrinsic and Extrinsic semiconductors**.

2. Define **Alpha (alpha) and Beta (beta)** for a transistor and establish the relationship between them.

3. **Differentiate between BJT and MOSFET** based on construction, input impedance, and control mechanism.

4. Draw the **block diagram of an Operational Amplifier (OP-AMP)**. List any four characteristics of an ideal OP-AMP.

5. Differentiate between **Astable Multivibrator** and **Monostable Multivibrator** circuits using **IC 555**. Define **Duty Cycle**.

6. Differentiate between **Sequential Logic Circuits** and **Combinational Logic Circuits** with suitable examples.

7. Define, draw the symbol, and write the truth table for the **NAND Gate** and **EX-OR Gate**. (Know why NAND and NOR are called universal gates).

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8. Draw the logic diagram and truth table for a **D Flip-Flop** and explain its function as a **delay element (latch)**.
9. Define **Shift Register**. Explain the difference between **SIPO** (Serial-In Parallel-Out) and **PISO** (Parallel-In Serial-Out) registers.

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3 **"AA BHI SAKTA HAI" QUESTIONS**

1. Explain the characteristics and applications of **LASER diodes** and **Photodiodes**.
2. Explain the need and function of the various **capacitors (coupling and bypass)** used in a single-stage CE amplifier circuit.
3. Explain the working of a **4:1 Multiplexer (MUX)** and a **1:4 Demultiplexer (DEMUX)** using block diagrams.
4. Draw the block diagram and explain the operation of a **Successive Approximation Register (SAR) ADC** (Analog-to-Digital Converter).
5. Explain the concept of the **Modulus of a Counter**. Draw the circuit of a **MOD-10 (Decade) Counter** using JK flip-flops.

ALSO PRACTICE THE CONVERSION OF DECIMAL INTO HEXADECIMAL , BINARY NUMBERS ..

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