

UNIT 5: LINEAR AND DIGITAL ELECTRONICS

Two-Mark Questions:

Linear Electronics:

1. **What are the ideal characteristics of an operational amplifier (Op-Amp)?**
2. **Explain the function of an inverting amplifier using an operational amplifier.**
3. **Explain the function of a non-inverting amplifier using an operational amplifier.**
4. **What is the concept of virtual ground in an Op-Amp circuit?**
5. **What is the significance of feedback in an operational amplifier?**
6. **State the applications of an operational amplifier.**
7. **What is the difference between an inverting and a non-inverting amplifier?**
8. **Explain the working principle of a summer circuit using an Op-Amp.**
9. **What are the applications of a clipper circuit?**
10. **What is a clamper circuit? How does it work?**
11. **What is the frequency response of an Op-Amp?**
12. **How is an Op-Amp used in a voltage follower configuration?**
13. **What is the difference between a summer and a differential amplifier?**
14. **What is an integrator circuit in Op-Amp?**
15. **Explain the principle of a differentiator circuit using an Op-Amp.**

Digital Electronics:

16. **What is Boolean Algebra? Why is it important in digital circuits?**
17. **State and explain De Morgan's Theorem.**
18. **Explain the concept of a logic gate.**
19. **What are the basic logic gates?**
20. **What is the function of an AND gate?**
21. **What is the function of an OR gate?**
22. **What is the role of a NOT gate in digital circuits?**

23. What is a half adder?
 24. What is a full adder? How is it different from a half adder?
 25. Explain the working of a JK flip-flop.
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Problems:

Linear Electronics:

1. **Problem 1:**
Design a non-inverting amplifier with a gain of 10 using an Op-Amp. If the input voltage is 1V, what will be the output voltage?
 2. **Problem 2:**
Calculate the output of an inverting amplifier when the input is 2 V, and the feedback resistance is 10 k Ω while the input resistance is 2 k Ω .
 3. **Problem 3:**
A summer circuit is designed with resistors of 10 k Ω , 20 k Ω , and 30 k Ω . Calculate the output voltage if the input voltages are 5 V, 10 V, and 15 V.
 4. **Problem 4:**
Design a clipper circuit using an Op-Amp to clip an input signal to a positive value of 5V. What will be the output if the input voltage is 7 V?
 5. **Problem 5:**
A differentiator circuit with an input frequency of 10 kHz and a capacitor of 100 pF is designed. Calculate the output voltage if the input voltage is 2 V.
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Digital Electronics:

6. **Problem 1:**
Construct a truth table for a NAND gate with two inputs.
7. **Problem 2:**
Simplify the Boolean expression: $A'B + AB' + AB$.
8. **Problem 3:**
Design a half adder and write its truth table. Calculate the sum and carry when the inputs are $A = 1$ and $B = 0$.

9. **Problem 4:**

Design a full adder and write its truth table. What are the sum and carry when $A = 1$, $B = 1$, and $C_{in} = 0$?

10. **Problem 5:**

Construct a JK flip-flop using logic gates and explain its operation with the truth table.