

1. Describe the working principle of a very simple CPU that can execute the following instructions.

Instruction	Instruction code	Operation
ADD	00AAAAAA	$AC \leftarrow AC + M[AAAAAA]$
AND	01AAAAAA	$AC \leftarrow AC \wedge M[AAAAAA]$
JMP	10AAAAAA	GO TO AAAAAA
INC	11XXXXXX	$AC \leftarrow AC + 1$

Draw the state diagram and explain how each instruction is executed.

2. Design the ALU that performs $AC \leftarrow AC + DR$ and $AC \leftarrow AC \wedge DR$
3. What is a microsequencer? Explain the control signals of a very simple CPU.
4. Explain the process of generating horizontal and vertical microcodes.
5. The instruction set of a very simple CPU is given as:

Instruction	Instruction code	Operation
COMP	00XXXXXX	$AC \leftarrow AC'$
JREL	01AAAAAA	$PC \leftarrow PC + AAAAAA$
OR	10AAAAAA	$AC \leftarrow AC \vee M[AAAAAA]$
SUB	11AAAAAA	$AC \leftarrow AC - M[AAAAAA] - 1$

- a. Design and implement state diagram
 - b. Design and implement register section and ALU
 - c. Design and implement Hardwired control unit
 - d. Design and implement microsequencer and control unit
6. Compare Hardwired control unit design and Microprogrammed control unit design.
 7. Explain the shift add multiplication algorithm with an example. Also write down the RTL.
 8. Trace the shift add algorithm for 10×6 .
 9. Trace the RTL code for shift add multiplication of 5×5 .
 10. Explain Booth's algorithm for multiplication of unsigned two's complement numbers with example.
 11. Trace the RTL code of Booth's algorithm for the operations -5×4
 12. Explain the Booth's algorithm for division with an example.