PART B

TRANSISTORS

3 TERMINAL DEVICES → VOLTAGE OF CURRENT AT ONE TERMINAL CONTROLS THE ELECTRICAL BEHAVIOR AT OTHER TERMINAL

1) BJT → BIPOLAR JUNCTION TRANSISTOR

\[ i_2 = \beta i_1 \]

IF \( \beta > 1 \), AMPLIFICATION

CCCS
CURRENT CONTROLLED CURRENT SOURCE

\[ i_2 \]
2) FET → FIELD EFFECT TRANSISTOR

\[ i_2 = g \cdot v_{13} \]

VC CS
VOLTAGE CONTROLLED
CURRENT SOURCE

SWITCH
"DIGITAL LOGIC"

"DC ANALYSIS AND DESIGN ONLY"
"IV CHARACTERISTICS"

Set of curves → Each curve corresponds to a different value of control signal (current or voltage) leading to different operating regions.

Biasing is needed to operate the device in specific operating region.

Example: BJT → Amplification requires biasing, using external circuit, in active region.
3 OPERATING REGIONS

BJT

1) CUT-OFF
2) ACTIVE
3) SATURATION

FET

1) CUT-OFF
2) NON-SATURATION / TRIODE
3) SATURATION

 amphlifer

switch

switch
 BJT SIMPLE Sewer

\[ \dot{i}_2 = \beta \dot{i}_1 \]

\[ v_{23} \]

 PET SIMPLE Sewer

\[ \dot{i}_2 = q \dot{v}_{13} \]

\[ v_{23} \]
Applications

1) Signal Amplification → Small Signal Replicated and Amplified

2) Switching → "Power" Inverters
   Low Power Input Controls
   High Power Output

DC Voltage

Diagram:

3) Logic Operations → Digital Logic Functions

Implementation

\[ \Phi \text{ Discrete} \rightarrow \]
2) IC →