Bhartiya Vidya Bhavan's Shri Ishvarlal L. P. Arts-Science and J. Shah Commerce College, Dakor
Dakor - 388225, Dist. – Kheda, Gujarat

B.Sc. (semester -3)

Subject : Physics

Course : USO3CPHY22

BASIC SOLID STATE ELECTRONICS

UNIT 3: FEEDBACK IN AMPLIFIERS

Lecture 1

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❖syllabus:-

UNIT III Feedback in Amplifiers and Oscillators

Concepts of feedback in amplifiers, Types of feedback, Voltage gain of feedback amplifier Advantages of negative feedback, Stabilization of gain, Reduction in distortion and noise, Increase in input impedance, Decrease in output impedance, Increase in bandwidth, Amplifier circuit with negative 'eedback, RC coupled amplifier without bypass capacitor, Emitter follower, **Oscillators:** Need of an oscillator, Classification of oscillators, Tuned circuit for generation of sine waves, Frequency of oscillation in LC circuit, Sustained oscillations, Positive feedback amplifier as an oscillator, The starting voltage, Hartley oscillator, Colpitts oscillator, Basic principles of RC oscillators, Phase shift oscillator, Wien bridge oscillator

- Introduction
- Concept of Feedback in Amplifier
- Types of Feedback
  - Positive and Negative Feedback
  - Series and Shunt type Feedback

❖INTRODUCTION

IN THIS UNITE WE ARE GOING TO STUDY FEEDBACK IN MPLIFIERS

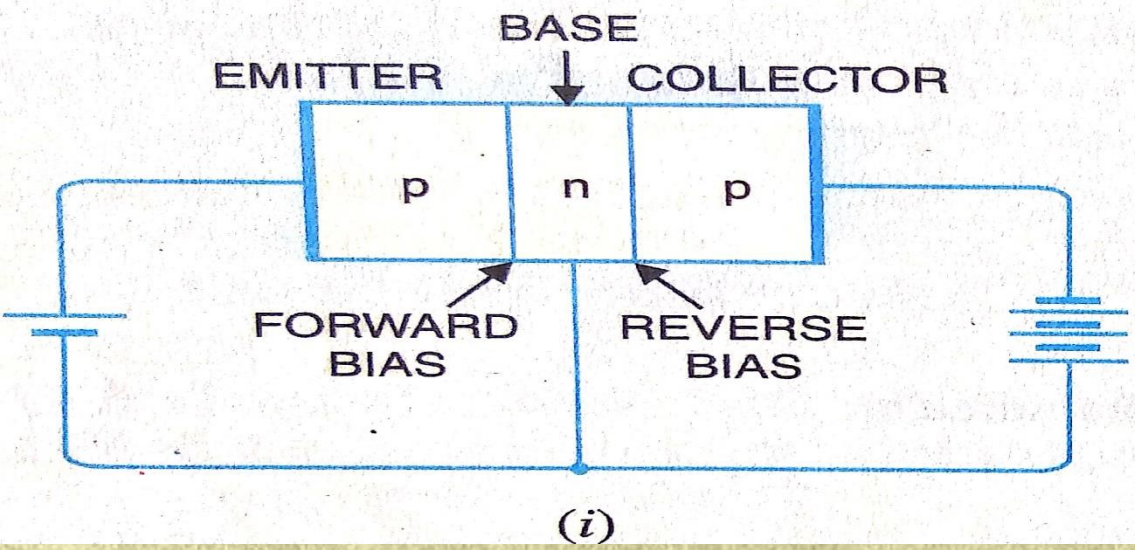
Before we start to learn feedback in amplifiers…

First of all we refresh our Basic knowledge and understanding about

AMPLIFIERS….

❖ Earlier we studied following things in Basic Electronics

- Two types of Semi conductors…… p type and n type…..
- Two types of Transistors….. PNP and NPN
- Two types of Bias…. Forward Bias and Reverse Bias



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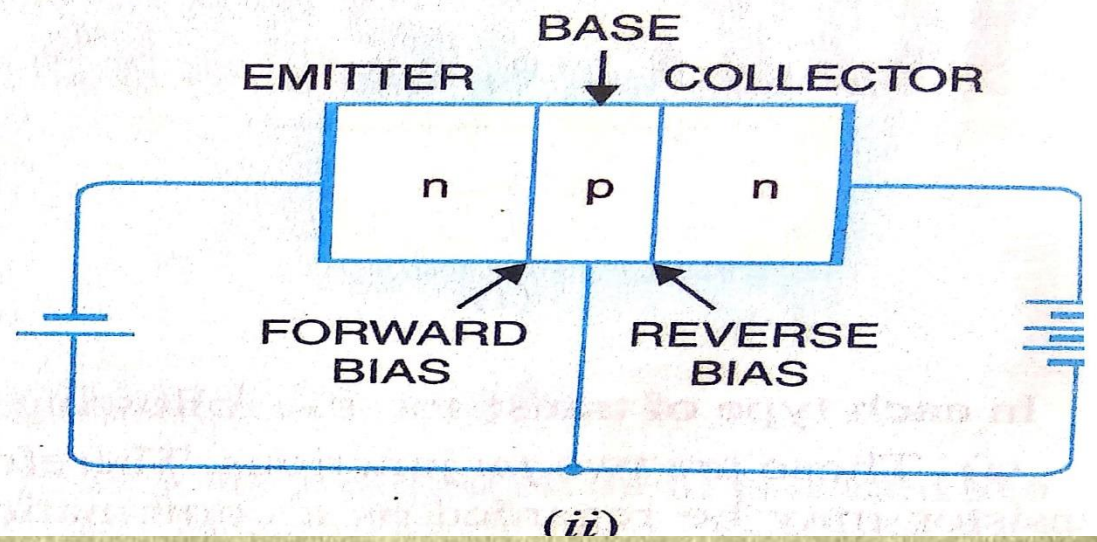
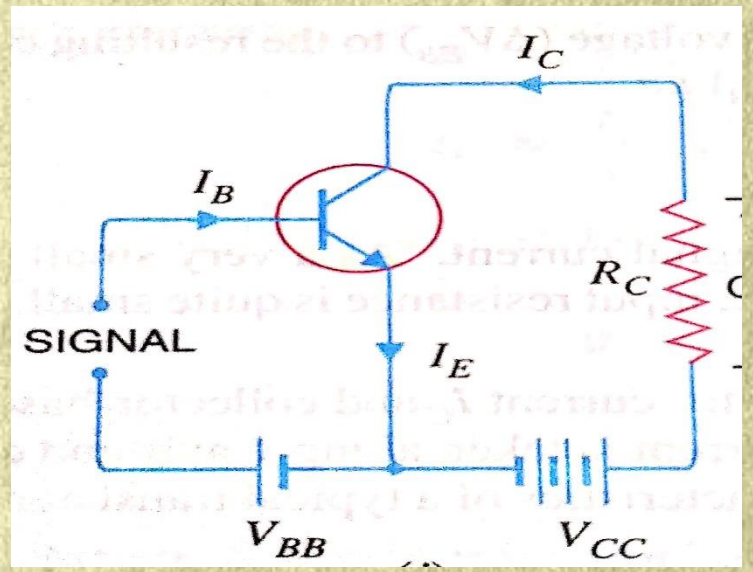


(ii)

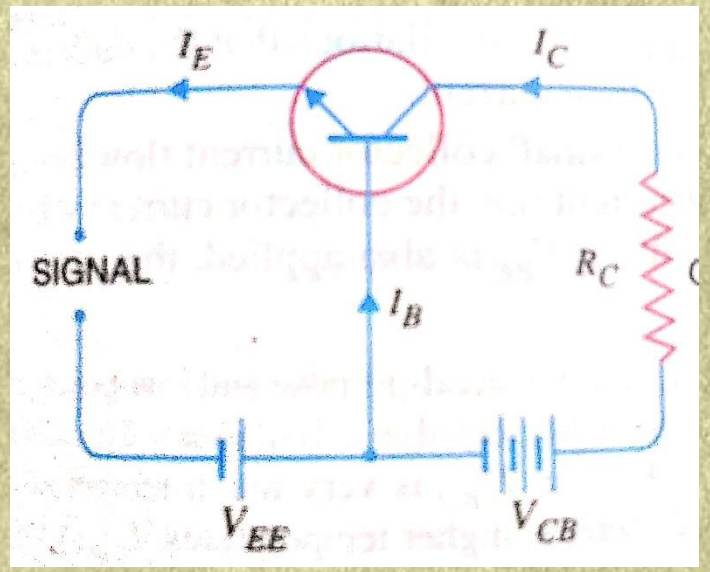
Earlier we studied following things in Basic Electronics

Transistor can be connected in circuit in THREE ways…..

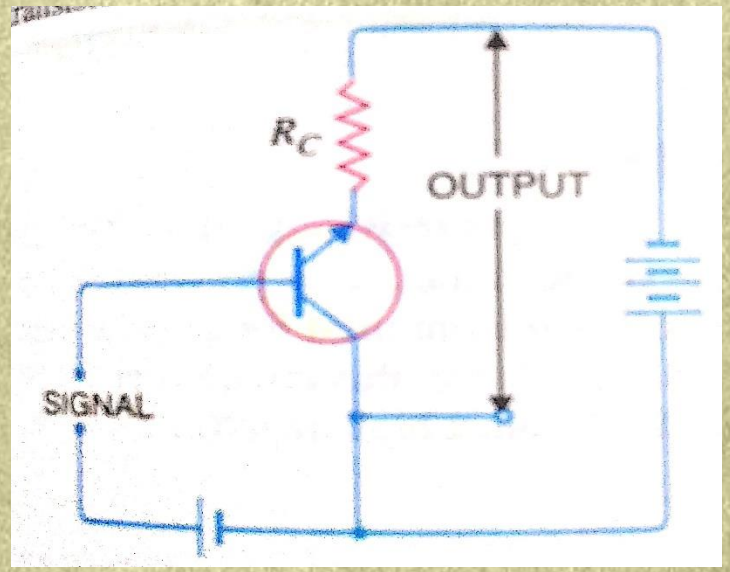
common Emitter



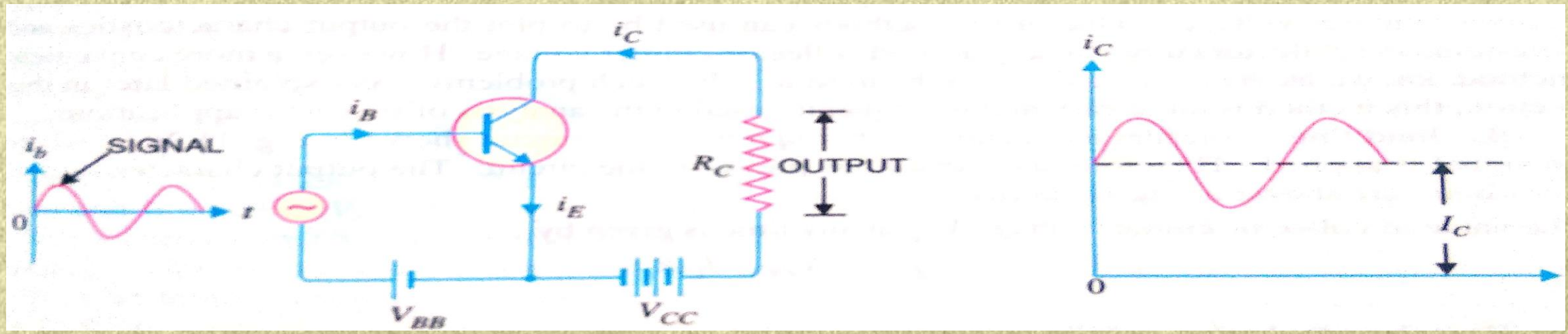
common Base



common Collector



➢ Basic Amplifier Circuit



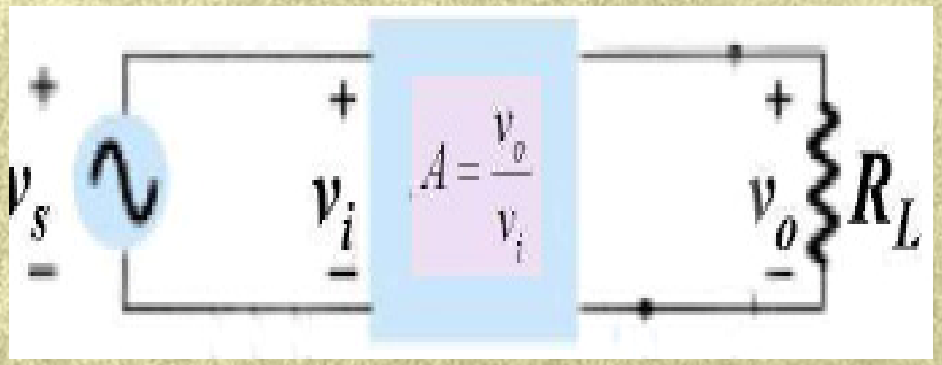
❖Concept of Feedback in Amplifier :

- Amplifiers are characterized by the parameters like Voltage gain, Input impedance , Output impedance , Bandwidth etc….
- These parameters are more or less constant for a given amplifier……
- But in different types of application we need to vary them……
- FEEDBACK is one of the mechanisms to do this……

❖Defination of Feedback:-

"Feedback is the process of taking part of output signal and feeding it back to the input circuit"……

For a basic amplifier shown in figure Voltage gain is



$$A = \frac{v_o}{v_s} = \frac{v_o}{v_i}$$

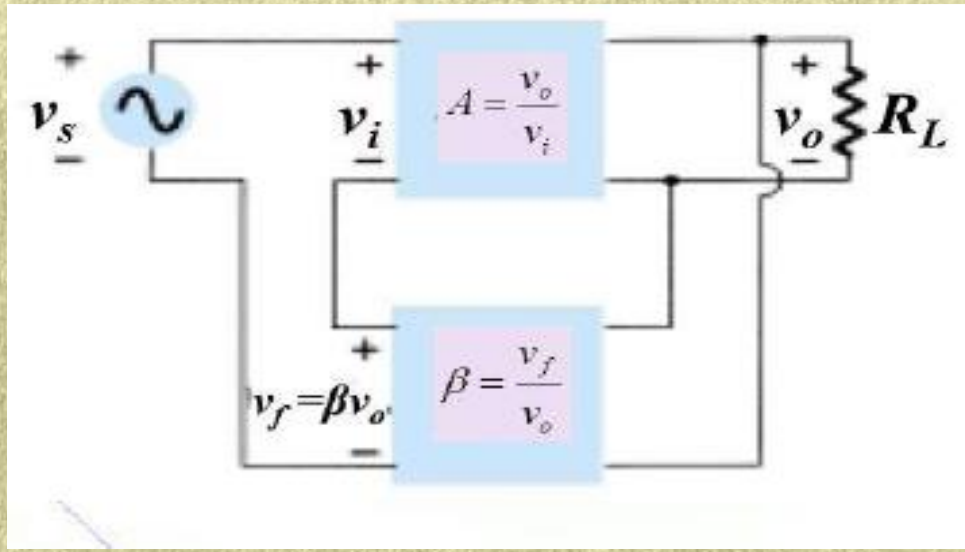
Here the input does not know what is happening at the output....

Such a system is called open loop or NON FEEDBACK SYSTEM.....

Now as shown in fig. below

if the output of the amplifier is fed back to the input through network

then it is called Feedback system or Closed loop system



The feedback network is called β network fraction of output equal to $V_f = \beta V_o$ is fed back into input and it modifies input…

❖ TYPES OF FEEDBACK:-

Mainly classified in TWO categories....

1) NEGETIVE FEEDBACK

2) POSITIVE FEEDBACK

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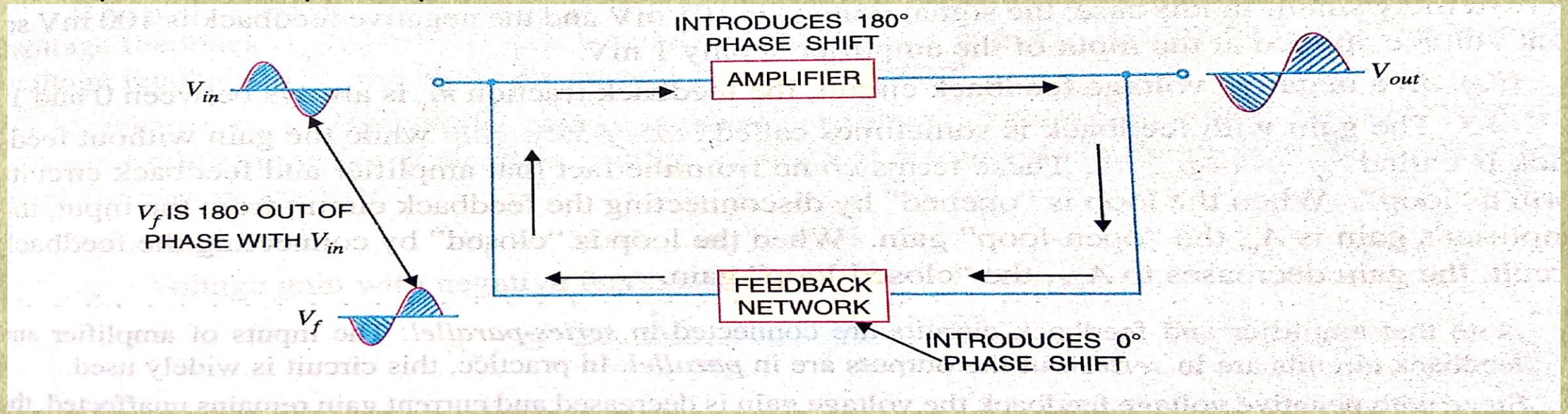
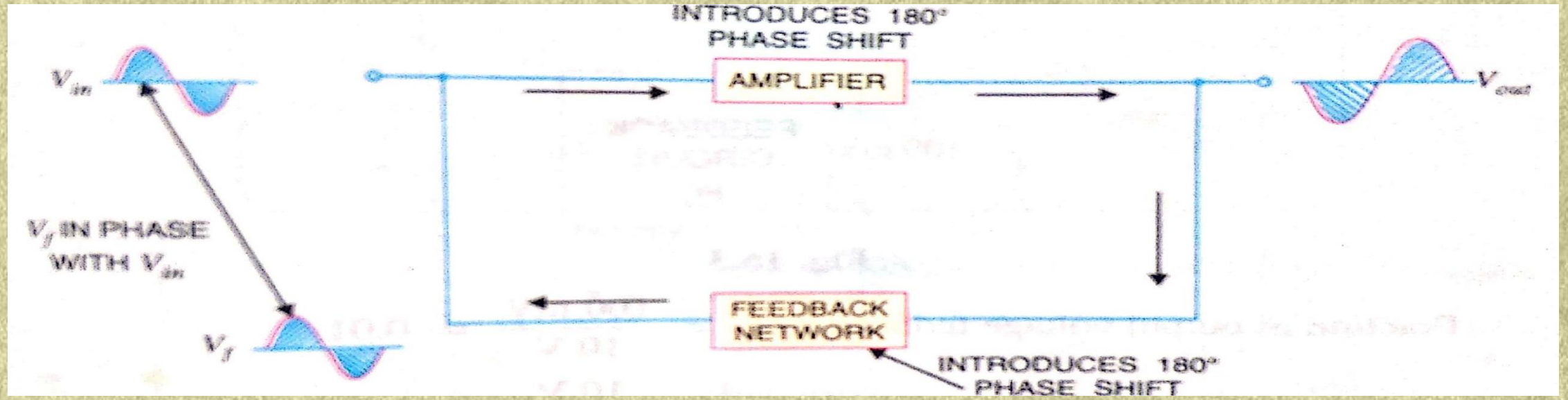
❖ NEGETIVE FEEDBACK:-

- When the feedback signal is out of phase with the input signal and thus opposes it, it is called negative feedback.
- The amplifier introduces a phase shift of 180° into the circuit while the feedback network is so designed that it introduces 0° phase shift.
- The result is that the feedback voltage Vf is 180° out of phase with the input signal Vin.
- Negative feedback reduces the gain of the amplifier.
- However, it provides low distortion, stability in gain, increased bandwidth and improved input and output impedances.



❖ POSITIVE FEEDBACK:-

- When the feedback signal is in phase with the input signal and thus aids it, it is called positive feedback.
- Both amplifier and feedback network introduce a phase shift of 180°.
- The result is a 360° phase shift around the loop, causing the feedback voltage Vf to be in phase with the input signal Vin.
- The positive feedback increases the gain of the amplifier. However, it increased distortion and instability.

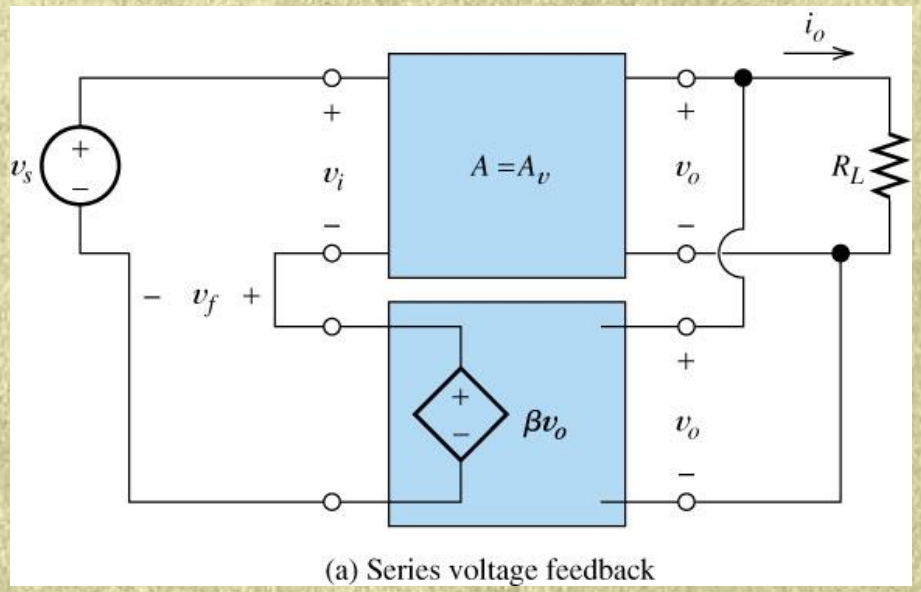


❖Amplifier negative feedback types

- If the feedback network samples the output voltage, it is *voltage feedback*.
- If it samples the output current, it is *current feedback*.
- The feedback signal can be connected in series or in parallel with the signal source and the amplifier input terminals,
- so called *SERIES FEEDBACK* and SHUNT or *PARALLEL FEEDBACK*.
- there are FOUR types of negative feedback in amplifier circuits:
  - Series voltage feedback
  - Series current feedback
  - Shunt or Parallel voltage feedback
  - Shunt or Parallel current feedback

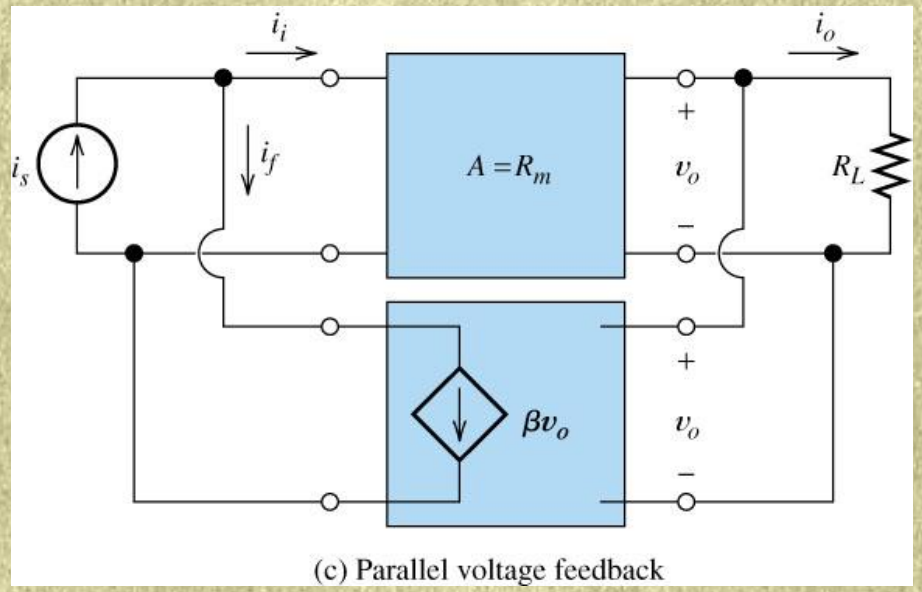
- In **voltage feedback,** the input terminals of the feedback network are in parallel with the load, and the output voltage appears at the input terminals of the feedback block.

Series voltage feedback



(a) Series voltage feedback

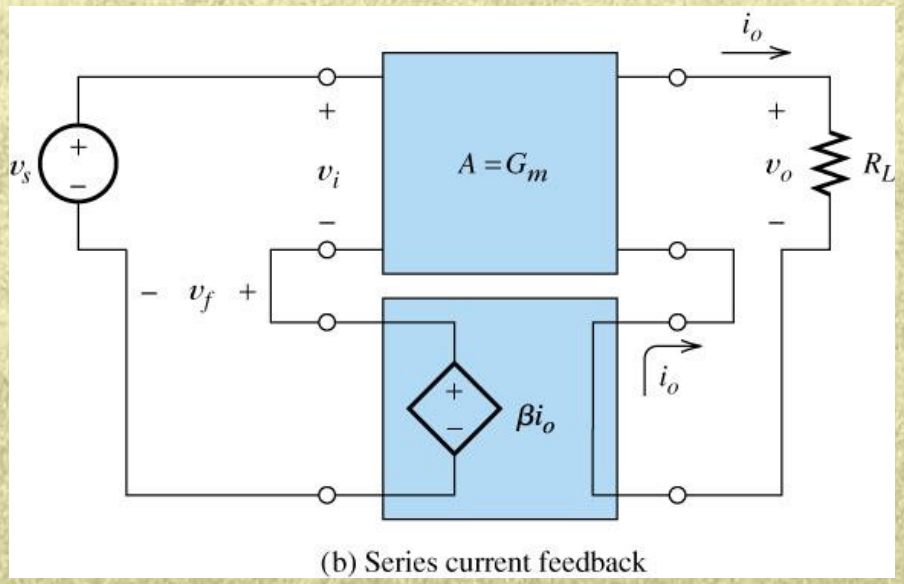
Shunt or Parallel voltage feedback



(c) Parallel voltage feedback

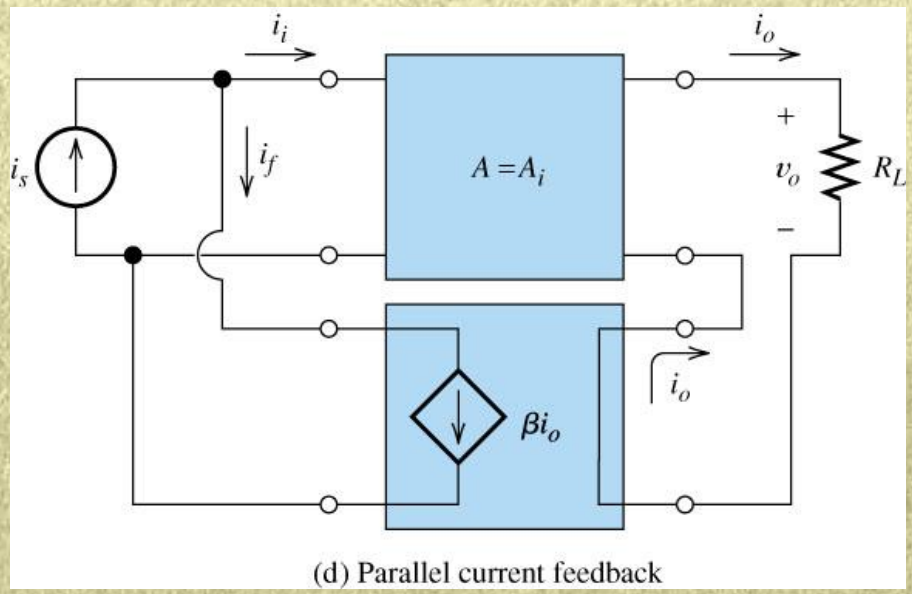
- Whereas in ***current feedback,*** the input terminals of the feedback network are in series with the load, and the load current flows through the input of the feedback block.

Series Current feedback



(b) Series current feedback

Shunt or Parallel current feedback



(d) Parallel current feedback

- As a result, a simple test on the feedback type is to open-circuit or short-circuit the load. If the feedback signal vanishes for an open-circuit load, then it is current feedback. If the feedback signal vanishes for a short-circuit load, it is voltage feedback.

- A Series feedback tends to increase the input impedance of the amplifier..
- Shunt or Parallel feedback tends to decrease the input impedance of the amplifier..
- A Voltage feedback tends to decrease the output impedance of the amplifier...
- Current feedback tends to decrease the output impedance of the amplifier...
- Most of the amplifier demands higher input impedance and lower output impedance
- which are both met in Series Voltage Feedback Amplifier...so...they widely used....

IN NEXT LECTURE WE TALK MORE ABOUT NEGETIVE FEEDBACK AMPLIFIERS IN DETAIL

THANK YOU.....