



# **SNS COLLEGE OF TECHNOLOGY**

## **(AN AUTONOMOUS INSTITUTION)**

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## **Department of Biomedical Engineering**

**Course Name: Control Systems**

**III Year : V Semester**

**Unit I – Systems and their Representation**

**Topic : Block Diagram Reduction**

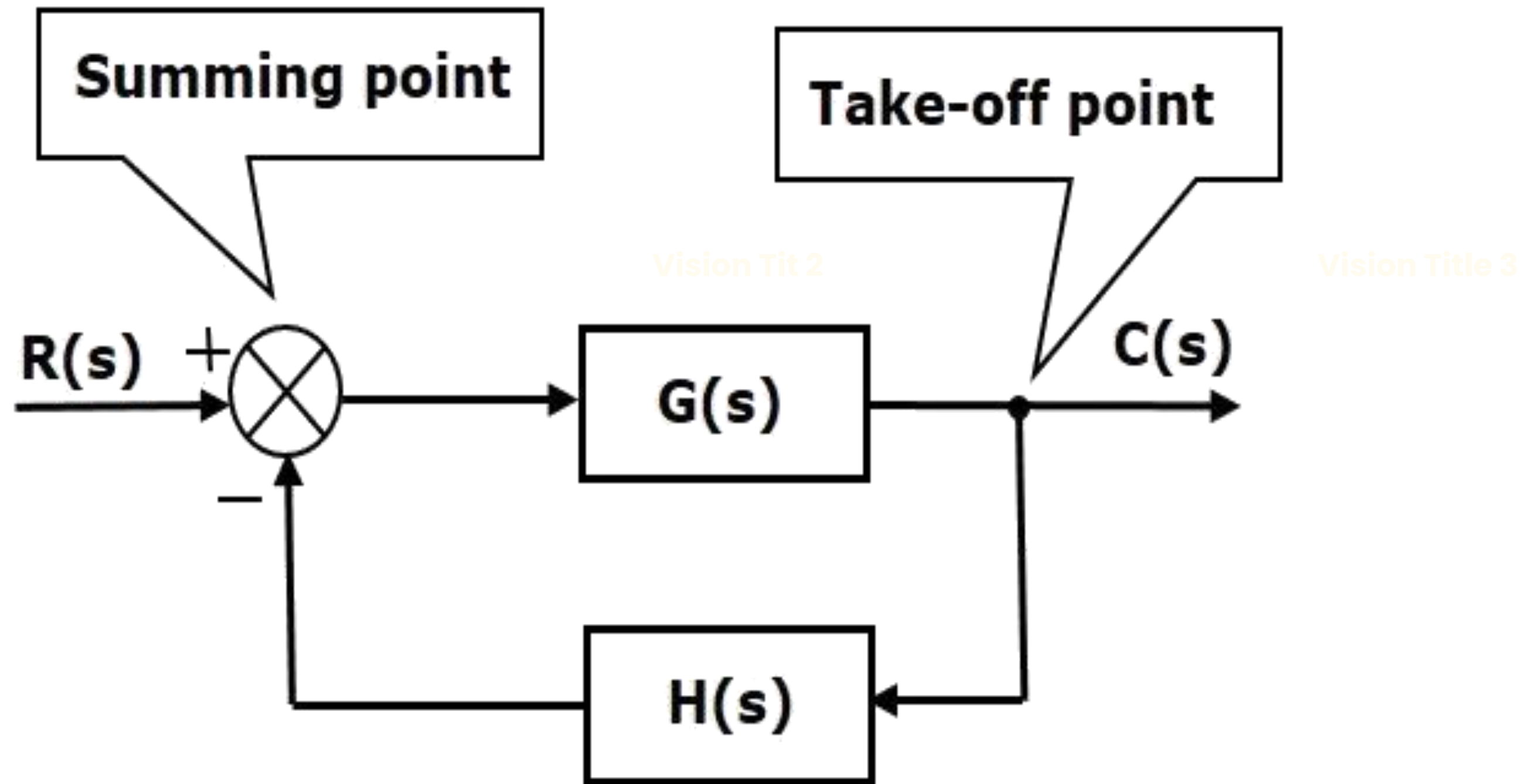


# Block Diagram

- Block diagrams consist of a single block or a combination of blocks.
- These are used to represent the control systems in pictorial form.
- Signal into the block represents the input  $R(s)$  and signal out of block represents output  $C(s)$ , while the block itself stands for the transfer function  $G(s)$ .
- Flow of information is unidirectional, output being equal to input multiplied by the transfer function of the block.



# Basic Elements of Block Diagram





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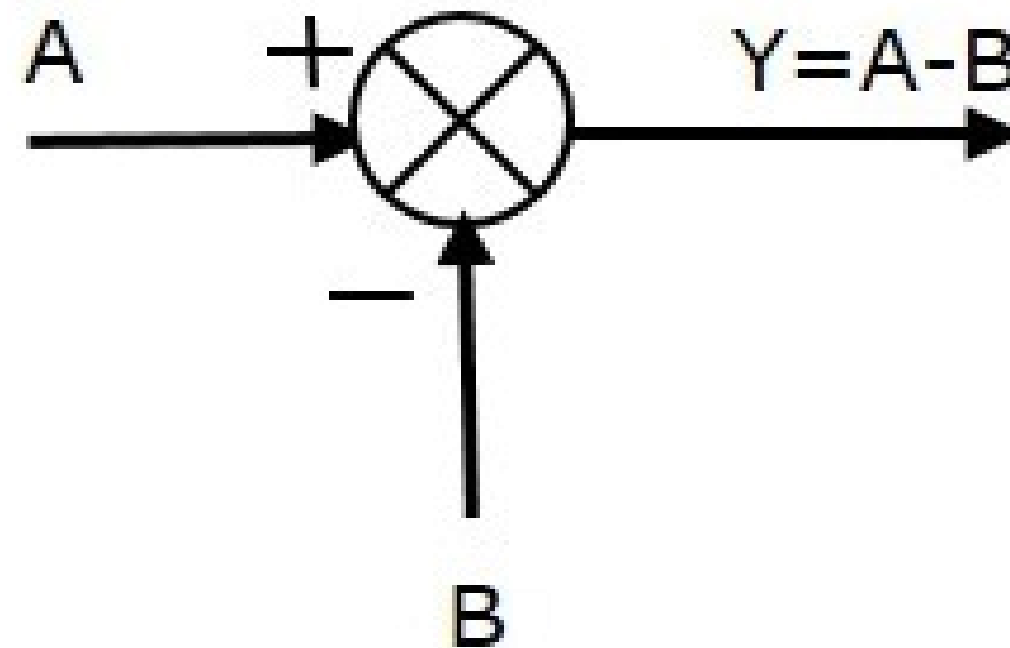
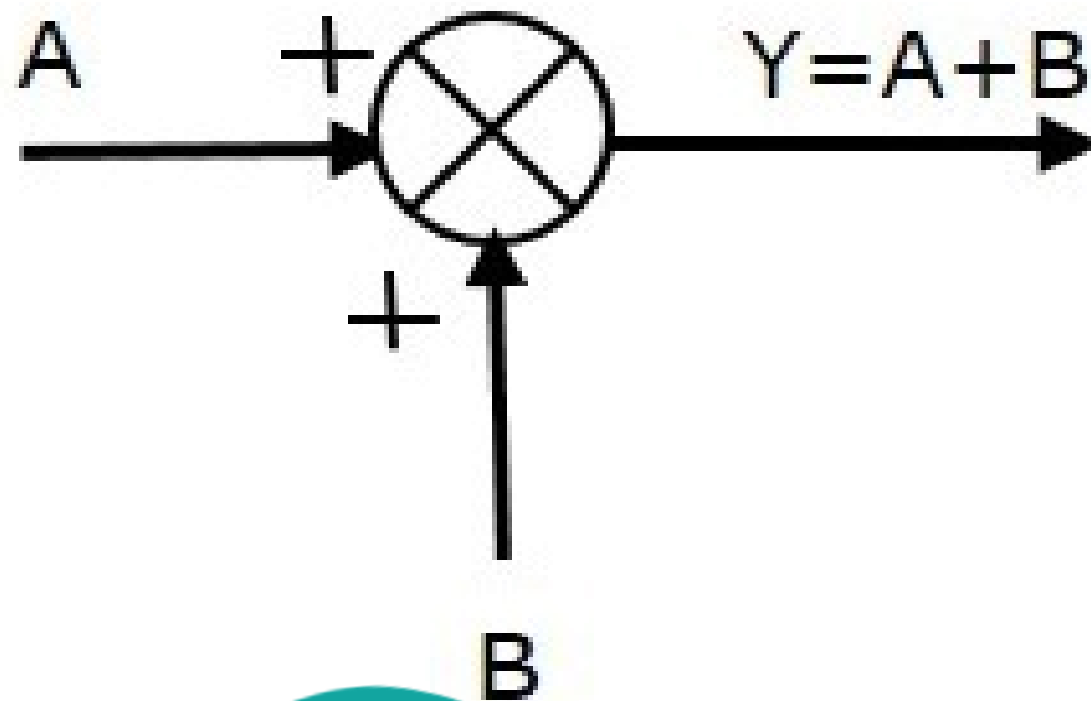
- **Block:**



$$Y(s) = G(s) * X(s)$$

Vision Tit 2

- **Summing Point:**





## Rules for BDR

- Reduce the series blocks
- Reduce the parallel blocks.
- Reduce minor feedback loops.
- As far as possible shift summing point to the left and take-off point to the right.
- Repeat the above steps till canonical form is obtained.

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# Rules for BDR

	Manipulation	Original Block Diagram	Equivalent Block Diagram	Equation
1	Combining Blocks in Cascade			$Y = (G_1 G_2) X$
2	Combining Blocks in Parallel; or Eliminating a Forward Loop			$Y = (G_1 \pm G_2) X$
3	Moving a pickoff point behind a block			$y = G u$ $u = \frac{1}{G} y$
4	Moving a pickoff point ahead of a block			$y = G u$
5	Moving a summing point behind a block			$e_2 = G(u_1 - u_2)$
6	Moving a summing point ahead of a block			$y = G u_1 - u_2$
				$y = (G_1 - G_2) u$