SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Course Name: Control Systems

III Year : V Semester

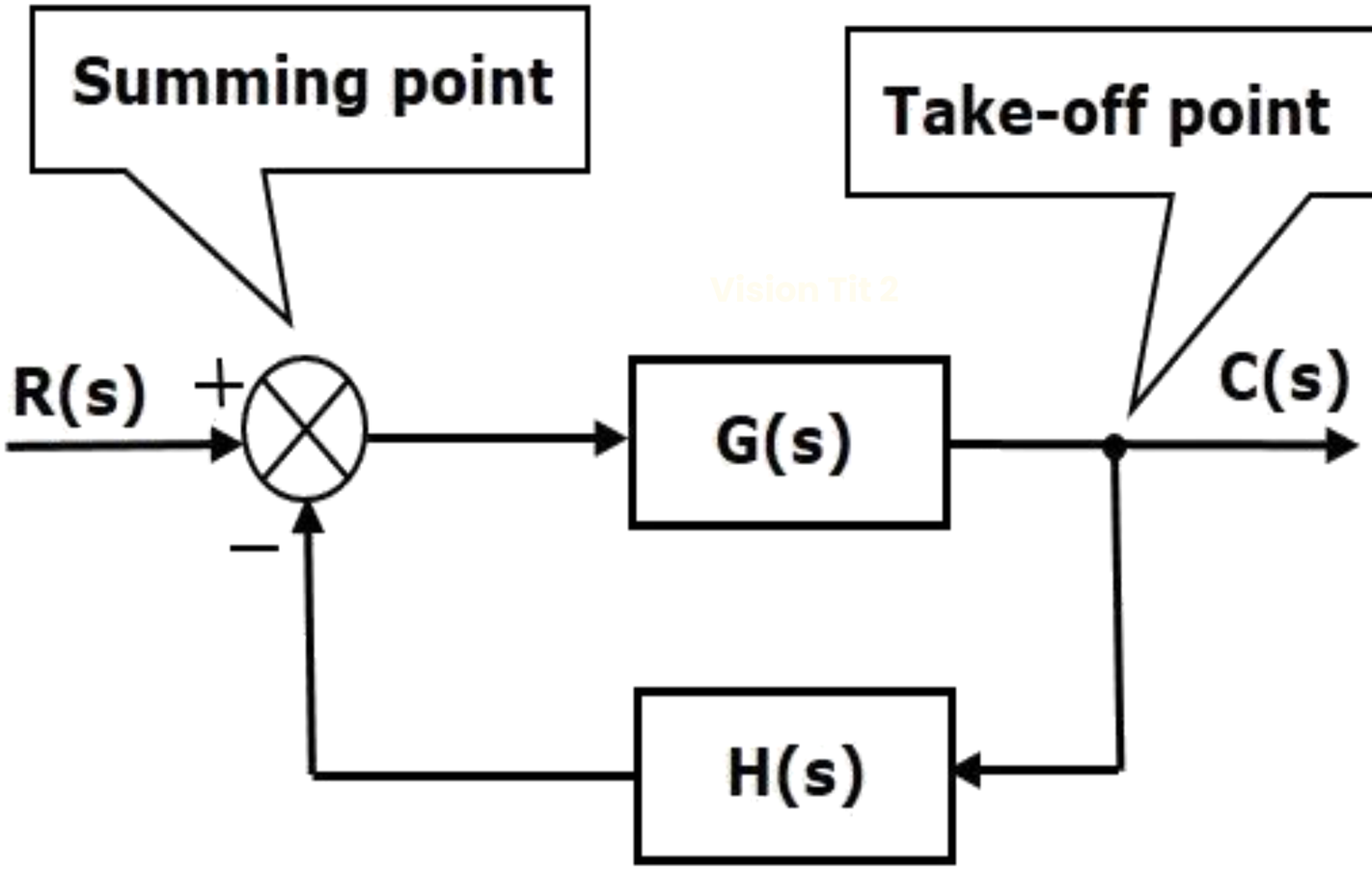
Unit I –INTRODUCTION TO PHYSIOLOGICAL MODELING

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

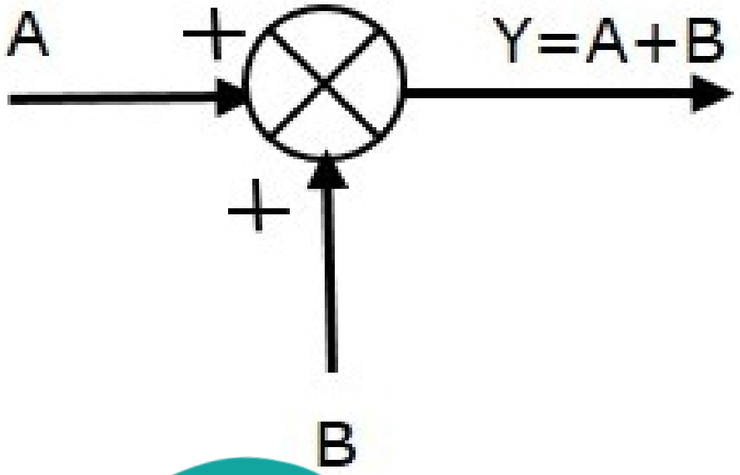


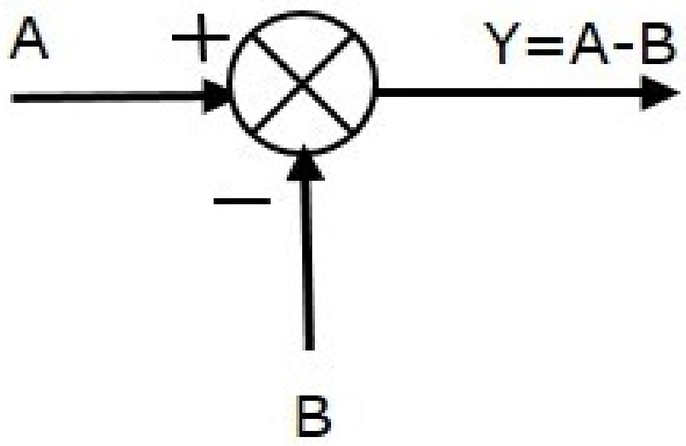
Basic Elements of Block Diagram

- **Block:**

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

- Summing Point:

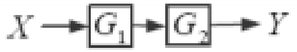
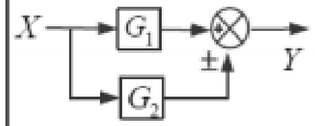
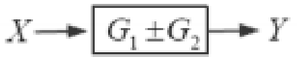
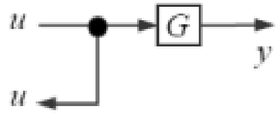
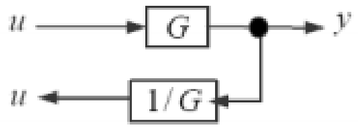
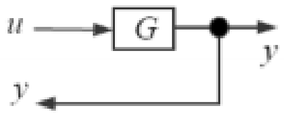
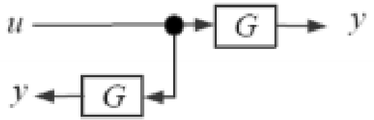
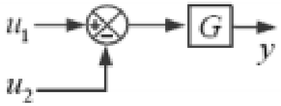
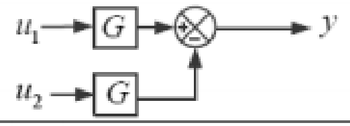
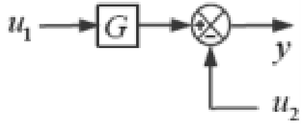
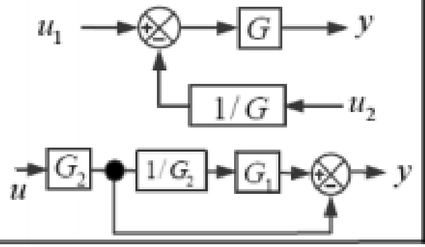




Rules for BDR

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

Rules for BDR

	Manipulation	Original Block Diagram	Equivalent Block Diagram	Equation
1	Combining Blocks in Cascade			$Y=(G_1G_2)X$
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			$y = Gu$ $u = \frac{1}{G}y$
4	Moving a pickoff point ahead of a block			$y = Gu$
5	Moving a summing point behind a block			$e_2 = G(u_1 - u_2)$
6	Moving a summing point ahead of a block			$y = Gu_1 - u_2$ $y = (G_1 - G_2)u$

Thank You