No matter how perfect the system design, the application of a load to a two-port system will affect the voltage gain. Therefore, there is no possibility of a situation where A_{v_1}, A_{v_2}, and so on, of Fig. 5.69 are simply the no-load values. The loading of each succeeding stage must be considered. The no-load parameters can be used to determine the loaded gains of Fig. 5.69, but Eq. (5.93) requires the loaded values.

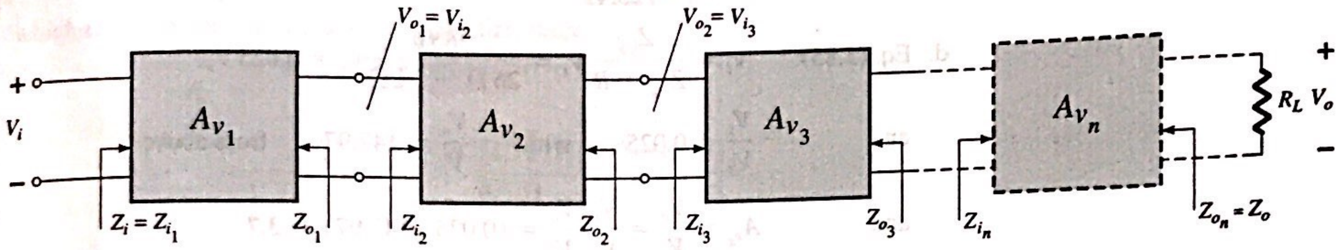

FIG. 5.69
Cascaded system.

EXAMPLE 5.14 The two-stage system of Fig. 5.70 employs a transistor emitter-follower configuration prior to a common-base configuration to ensure that the maximum percentage of the applied signal appears at the input terminals of the common-base amplifier. In Fig. 5.70, the no-load values are provided for each system, with the exception of Z_i and Z_o for the emitter-follower, which are the loaded values. For the configuration of Fig. 5.70, determine:

a. The loaded gain for each stage.
b. The total gain for the system, A_v and A_{v_s}.
c. The total current gain for the system.
d. The total gain for the system if the emitter-follower configuration were removed.

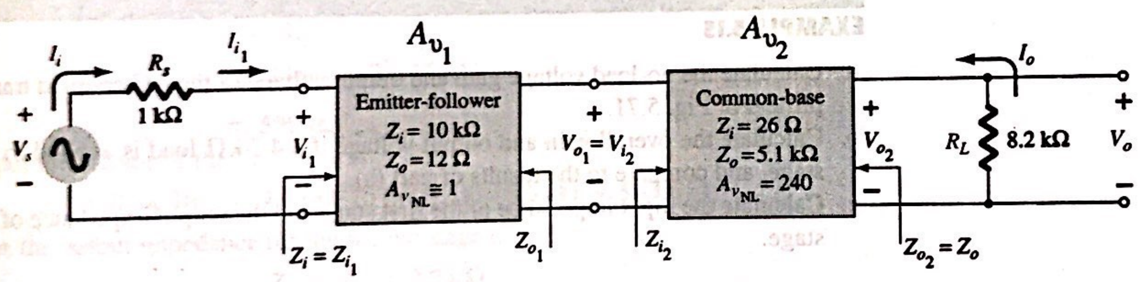

FIG. 5.70
Example 5.14.

Solution:

a. For the emitter-follower configuration, the loaded gain is (by Eq. (5.88))

$$V_{o_1} = \frac{Z_{i_2}}{Z_{i_2} + Z_{o_1}} A_{v_{NL}} V_{i_1} = \frac{26\ \Omega}{26\ \Omega + 12\ \Omega}(1)\ V_{i_1} = 0.684\ V_{i_1}$$

and $$A_{v_1} = \frac{V_{o_1}}{V_{i_1}} = 0.684$$

For the common-base configuration,

$$V_{o_2} = \frac{R_L}{R_L + R_{o_2}} A_{v_{NL}} V_{i_2} = \frac{8.2\ \text{k}\Omega}{8.2\ \text{k}\Omega + 5.1\ \text{k}\Omega}(240)\ V_{i_2} = 147.97\ V_{i_2}$$

and $$A_{v_2} = \frac{V_{o_2}}{V_{i_2}} = 147.97$$

b. Eq. (5.93): $A_{v_T} = A_{v_1} A_{v_2}$

$$= (0.684)(147.97)$$
$$= 101.20$$