

[ECE3455Q1] An amplifier has a transfer characteristic given by

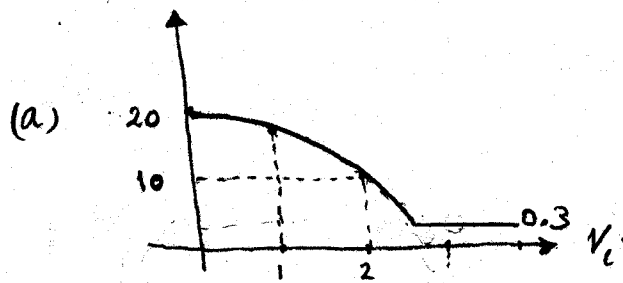
$$V_o = 20 - 2.5 (V_i)^2 \quad \text{for } 0.3 < V_o < 20$$

And outside this region the amplifier saturates.

(A)

- Sketch the transfer characteristic (approximately)
- Bias the input so that $V_o = 2$ [V]
- If V_i is sinusoidal, find its largest amplitude without saturation.
- Find the amplifier voltage gain at the specified biasing point.

Solution:



(b) $2 = 20 - 2.5 V_i^2$ $Q \begin{cases} V_i = 2.68 \\ V_o = 2 \end{cases}$

(c) $V_o = 0.3$ $0.3 = 20 - 2.5 V_i^2$ $V_i = 2.80$

So the maximum input amplitude is

$$V_{im} = 2.80 - 2.68 = 0.12 \text{ V}$$

d) $\left. \frac{dV_o}{dV_i} \right|_{V_i = 2.68} = -5 V_i \Big|_{V_i = 2.68} = -13.4$