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(ECE3455, Q1, Sum03) a) the transfer function of an amplifier is given by:

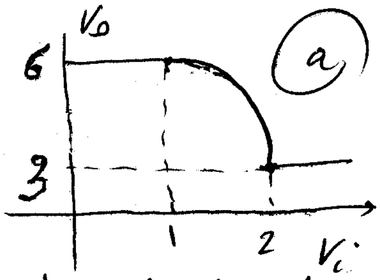
$V_o = 6$ [V] for $V_i < 1$ [V]
$V_o = 7 - V_i^2$ for $1 < V_i < 2$
$V_o = 3$ [V] for $V_i > 2$

Find the input biasing voltage at which the voltage gain is a maximum.
b) If we approximate the above TC by the following linear TC:

$V_o = 6$ [V] for $V_i < 1$ [V]
$V_o = 8 - 2V_i$ for $3 < V_o < 5$ [V]
$V_o = 3$[V] otherwise

Find the following values for this TC,

1) The appropriate input biasing voltage
2) The maximum amplitude of input
3) The maximum amplitude of the output
4) The DC value of the output voltage

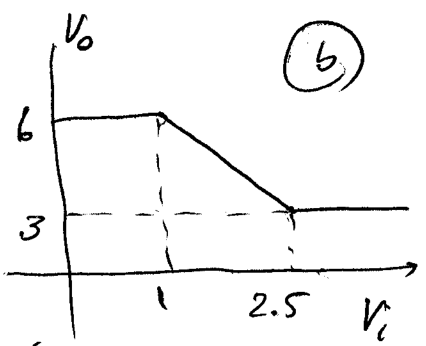


solution:

a) To find the gain, we should take derivative of TC. In Saturation regions deralatives are Zero but in non-linear region i.e. $V_o = 7 - V_i^2$

$$\frac{dV_o}{dV_i} = -2V_i$$

and for $V_i = 2$ $\quad \frac{dV_o}{dV_i} = -4$



(b)

(1) input biasing $V_I = \frac{1 + 2.5}{2} = 1.75$ [V]

(2) maximum input amplitude $V_i(max) = \frac{2.5 - 1}{2} = 0.75$ [V]

(3) " output " $V_o(max) = \frac{6 - 3}{2} = 1.5$ [V]

(4) DC " value $V_o(DC) = \frac{6 + 3}{2} = 4.5$ [V]