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① Current Eq of a diode:

$$\rightarrow I_D = I_0 \left(e^{\frac{V}{\eta V_T}} - 1 \right)$$

V → Applied voltage

V_T → Temp(K) / 11600

I_D → Diode current

I_0 → Reverse Saturatⁿ current (I_0)

↳ doubles for 10° rise in temp

$\eta_{si} = 2$; $\eta_{Ge} = 1$

@ Room temp. $V_T = 26mV$ ↳ 26×10^{-3} V

② half wave rectifier:

① $V_{DC} = \frac{V_m}{\pi}$; $V_{rms} = \frac{V_m}{2}$

② $\gamma = 1.21 \approx 121\%$

③ % Efficiency (η) = 40.5%

③ Full Wave Rectifier:

① $V_{DC} = \frac{2V_m}{\pi}$; $V_{rms} = \frac{V_m}{\sqrt{2}}$

② $\gamma = 0.483 \approx 48\%$

③ % Efficiency (η) = 81.05%

$\frac{\text{o/p power}}{\text{I/p power}}$

or

$$81.05 \left(\frac{R_L}{R_s + R_f + R_L} \right)$$

this factor can also be multiplied to non ideal V_{out}

R_s → Source Resist

R_L → load resist.

HWR ⇒ R_f → diode forward bias rest.

FWR = $2R_f$

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(4) Ripple factor (γ) = $\dfrac{\text{AC component}}{\text{DC component}}$

or

$$\gamma = \sqrt{\left(\frac{V_{rms}}{V_{DC}}\right)^2 - 1} \quad \text{or} \quad \sqrt{\left(\frac{I_{rms}}{I_{DC}}\right)^2 - 1}$$

(5) C-Filter Ripple : $\dfrac{1}{4\sqrt{3} f R_L C}$

(a) $f = 50\,Hz$

$R_L = 1\,\Omega$

$C = 1\,F$; $\gamma = 0.00288$

≈ 0

(6) Q factor of Diode = $\dfrac{X_C}{R}$; $X_C = \dfrac{1}{2\pi f C}$

Unit : 2

BJT

$\alpha = h_{fb}$

(1) $\dfrac{1}{\alpha} = \dfrac{1}{\beta} + 1$

$\beta = h_{fe}$

$\gamma = h_{fc}$

(2) $\gamma = \beta + 1$

$\gamma = \dfrac{1}{1-\alpha}$

(3) Midband Gain = $20 \log_{10} \dfrac{V_o}{V_i}$ dB

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JFET

① Current Eq^n = $I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_{PP}}\right)^2$

I_{DSS} ↳ Saturat^n drain current

V_{PP} ↳ Pinchoff Volt

(*) Note: $V_{PP} = V_{GS(off)}$

② Transconductance (~~gm~~ G_m) = opp. of resist

↳ $\frac{\text{Current} \to \text{Output}}{\text{voltage} \to \text{Input}}$

CS configuration

Amplification factor (μ)

↳ $\frac{V_{\text{output side}}}{V_{\text{input side}}}$

OR

$\frac{\Delta V_{out}}{\Delta i_{out}} \times \Delta G_m$

Resist. out ← $\frac{\Delta V_{out}}{\Delta i_{out}}$

Unit: 3

① Feedback Gain A_{vf} = $\frac{A}{1-AB}$ (+ve feedback)

$\frac{A}{1+AB}$ (-ve ")

A - Gain of ~~Oscillator~~ Amplifier
B - Gain of feedback ckt.

② Oscilating freq. (f) of tank ckt = $\frac{1}{2\pi\sqrt{LC}}$

$L_{series} = L_1 + L_2 + 2m$. Eq. $C_{series} = \frac{C_1 C_2}{C_1 + C_2}$

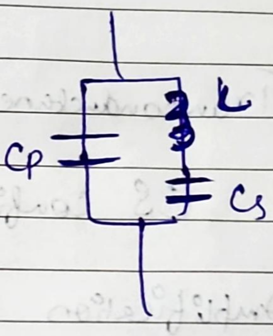
Eq ⓐ freq. for RC phase shift → Oscillator.

$f = \frac{1}{2\pi RC\sqrt{6}}$ & Gain $= \frac{1}{29}$

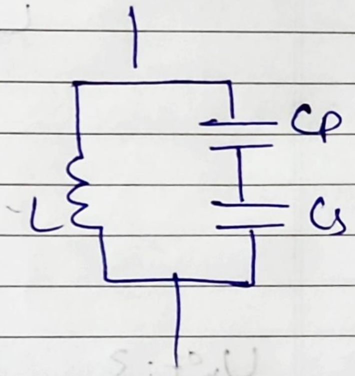
↳ of Tank ckt

Crystal Oscillator

for $f_s = \frac{1}{2\pi\sqrt{LC_s}}$



for $f_P = \frac{1}{2\pi\sqrt{\frac{1 + C_s/C_P}{LC_s}}}$



OP-AmPs

① for inverting OP Amp Gain $= \frac{-R_f}{R_1}$

② for non " " " Gain $= 1 + \frac{R_f}{R_1}$

∴ Gain $= \frac{V_{out}}{V_{in}}$

If Vout is asked in Inverting/Non Inverting
Subs. Gain formula in ① & ② & solve