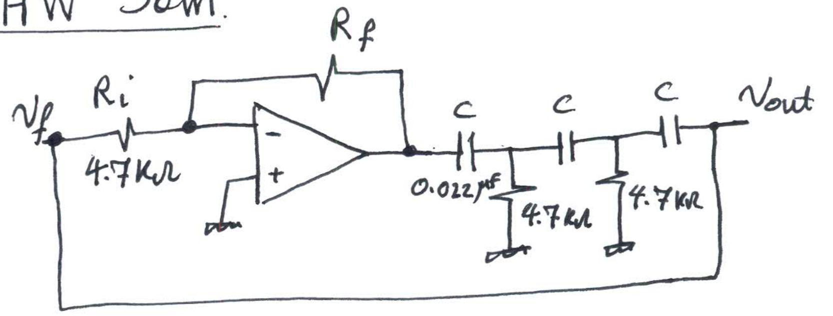
Ch.16 HW Soln.

11 R_f ??, for oscillation ; f_r ??



⇑ phase-shift oscillator

$\because A_{cl} = \frac{R_f}{R_i}$

$\therefore R_f = R_i A_{cl}$

$\because$ for oscillation: $A_{cl} B = 1$; $B = \frac{1}{29} = \frac{V_f}{V_{out}}$

$\therefore A_{cl} = \frac{1}{B} = 29$

$\therefore R_f = 4.7\,k\Omega * 29$ $\quad \therefore \boxed{R_f = 136.3\ K\Omega}$

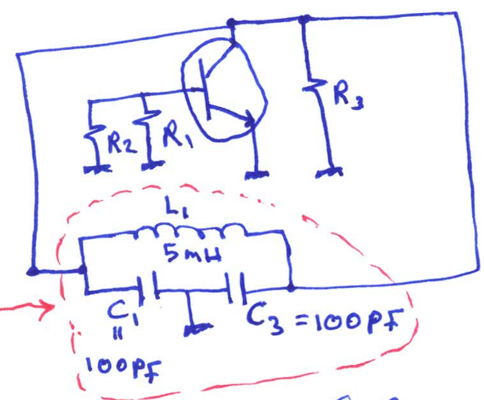
$\because f_r = \frac{1}{2\pi\sqrt{6}\,R_i C} = \frac{1}{2\pi\sqrt{6} * 4.7*10^{3} * 0.022*10^{-6}}$

$\therefore \boxed{f_r \simeq 628.4\ Hz}$

---

12 Type of oscillator ??, f_r ??

a) Colpitts Oscillator, as for ac-analysis we can redraw cct. as follows



Feedback cct.

where, C_2 & C_4 are almost O.C.

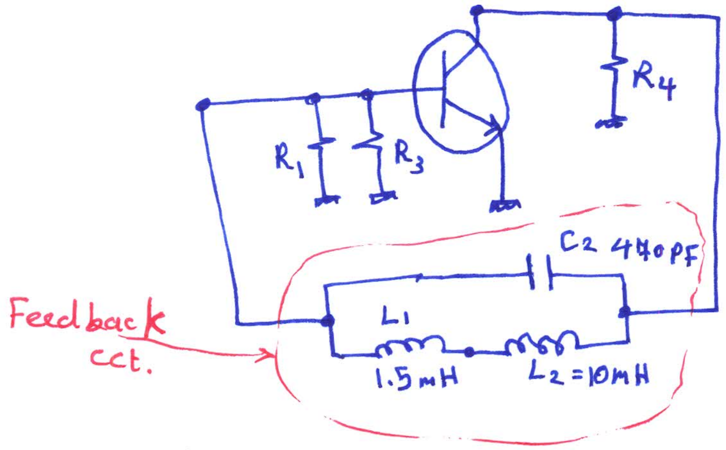
$\because f_o = \frac{1}{2\pi\sqrt{L_1 C_T}}$; $C_T = \frac{C_1 C_3}{C_1 + C_3} = \frac{100\,PF * 1000\,PF}{1100\,PF} = 90.91\,PF$

$\therefore f_o = \frac{1}{2\pi\sqrt{5*10^{-3} * 90.91*10^{-12}}} \simeq 236.1\ KHz$

$\therefore \boxed{f_o = 236.1\ KHz}$

12

b) Hartley oscillator, as the cct. can be drawn, in ac-analysis, as follows: (2



$$\therefore f_o = \frac{1}{2\pi\sqrt{L_T C_2}} \quad ; \quad L_T = L_1 + L_2 = 1.5 + 10 = 11.5 \text{ mH}$$

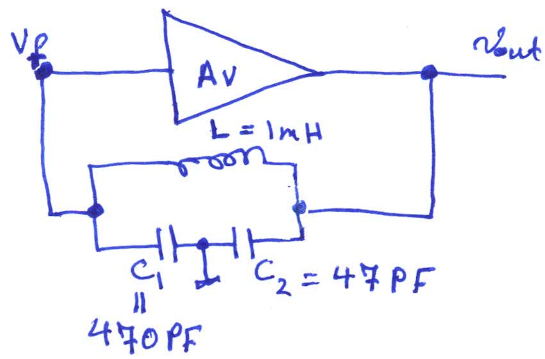
$$\therefore f_o = \frac{1}{2\pi\sqrt{11.5 * 10^{-3} * 470 * 10^{-12}}} \simeq 68.5 \text{ KHz}$$

$$\therefore \boxed{f_o = 68.5 \text{ KHz}}$$

---

13 $A_v = ??$, for sustained oscillation.

The given Colpitts oscillator is equivalent to:



attenuation of feedback cct., $B = \frac{-C_2}{C_1} = -\frac{47 \text{ PF}}{470 \text{ PF}} = -0.1$

To have oscillation:

$$A_{CL} = A_v B = 1 \qquad \therefore A_v = \frac{1}{B} = \frac{1}{-0.1}$$

$$\therefore A_v = -10$$