

Sheet 4

1	$\omega_c = 1/(RC) = 250 \text{ Rad./s}$ $V_o \omega_c(t) = 3\sqrt{2} \sin(\omega_c t - 45^\circ) \text{ V}$ $ V_o/E_{in} \text{ vs. } f/f_c$	9	$C_1 = 0.2533029591 \text{ nF}$ $L_k = 1.9444 \text{ mH}$ b) Low Pass Filter
2	$0.928, 1/\sqrt{2}, 0.328$ $-21.8^\circ, -45^\circ, -70.85^\circ$	10	$f_a = 22.5079079 \text{ kHz}$ $f_r = 24.93478748 \text{ kHz}$ ii) Band Pass Filter
3	$0.2434747, 0.7072, 0.996$ $78.69^\circ, 45^\circ, 14^\circ$	11	b) Band Stop Filter $Q_{eff} = 50.20847827$ $f_{1,2} = 2.034, 2.07494 \text{ MHz}$ $ V_R _{min} = 7.12688 \text{ V}$
4	High Pass Filter $ V_o = E_i \frac{1}{\sqrt{1 + \frac{R^2}{L^2 \omega^2}}}$ $\angle V_o = 90 - \tan^{-1} \frac{\omega L}{R}$	12	a) $R = 12.35955 \Omega$ $L = 0.2 \text{ mH}$ $f_s = 159.1549 \text{ kHz}$ b) $ I _{max} = 6.25 \text{ A}$ c) $R_{max} = 16.076 \Omega$
5	$Q_s = 22.5$ $f_{1,2} = 9.7778, 10.2222 \text{ kHz}$ If $R_L = 4 \text{ k}\Omega$ $Q_s \downarrow$ & B.W. \uparrow $f_{1,2 new} = 9.753, 10.247 \text{ kHz}$	13	Band Pass Filter a) $R_L = 3.6 \Omega, L = 2.8648 \text{ mH}, Q = 50$ $C = 88.4194 \text{ nF}$ b) $Q_{eff}' = 4.78 (\downarrow)$ B.W. = $2.09 \text{ kHz} (\uparrow)$
6	For V_L : Band Pass Filter $V_{L max} = 88.89 \text{ V}$ $Q_{eff} = 2.222$ $f_{1,2} = 15.9996, 25.00055 \text{ kHz}$ For V_{R1} : Band Stop Filter $V_{R1 min} = 100/9 \text{ V}$ $Q_{eff} = 19.876$ $f_{1,2} = 19.497, 20.503 \text{ kHz}$	14	a) Band Pass Filter $f_s = 3.1831 \text{ kHz}$ B.W. = 668.45 Hz $f_{1,2} = 2.86637, 3.5348 \text{ kHz}$ $ V_o _{max} = 95.238 \text{ V}$ b) Capacitor $C_{added} = 86.294772 \text{ nF}$ $ V_o @ \omega_r = 0.923424 \text{ V}$
7	$Q_s = 2.475$ B.W. = 20 Hz $f_{1,2} = 4.99, 5.01 \text{ kHz}$	15	a) $R_{min} = 27 \text{ k}\Omega$ b) Band Stop Filter $Q_{eff} = 69.013042$ B.W. = 297.7234 Hz $f_{1,2} = 20.3979, 20.6956 \text{ kHz}$
8	$C = 2.533029591 \text{ nF}$ $L_k = 0.416667 \text{ mH}$ $V_{Lr} = 0 \text{ V}, V_{La} = V_s = 10 \angle 0^\circ \text{ V}$ $C_k = 10.13211836 \text{ nF}$		