3B1 Radio Frequency Electronics 2011 – Numerical Answers

1(b) R1 = 920 Ω, R2 = 120 Ω, R3 = 9 Ω, R4 = 75 Ω, C = 10 nF

1(c) R' = 43 Ω, C' = 1.6 pF, f_{-3dB} = 2.31 GHz / stage

2(b) w = 0.72 mm

2(c) λ/2 = 15.6 cm

2(d) Pr = 3.9 nW, Vr = 0.54 mVrms

2(e) η = 90 %

3(b) C = 23.1 pF, R3 = 150 Ω, R2 = 18 kΩ, R1 = 10 kΩ, Rd = 1 kΩ, η = 6 %

3(d) Xs = 130 Ω, Xp = 173 Ω so, L = 59 nH & C = 2.6 pF OR L = 44 nH, C = 2 pF

4(a) Bessel, C1 = 11 nF, R1' = 840 Ω, C2 = 9.9 nF, R2' = 7590 Ω with R = 10 kΩ

4(b) T/line length = 0.233 m (= 0.446 λ), C = 4.8 pF

4(c) $L = CR^2$ hence for R = 10 kΩ, C = 100 pF