

3B1 – 2009 Numerical answers

1 (b) 26.2 km (1.33 pW)

1 (c) 17.3 cm each half. Range increases to 32.1 km

1(d) 70%

2 (b) Use a low pass Bessel filter (for pulse shape) @ 9600 Hz. $C_1 = 1.16$ nF, $C_2 = 1.03$ nF

2(c) $Q = 58$ with equiv. $R = 10.1$ k Ω . For $Q=100$, $R' = 17.4$ k Ω , hence shunt with -24 k Ω

3 (a) $R_4 = 100$ Ω , $R_3 = 15$ Ω , $R_2 = 120$ Ω , $R_1 = 680$ Ω

3 (b) 1.46 GHz (or 2.9 GHz incl. source impedance of 100 Ω)

3 (c) 57.7 mm

3 (e) 0.28 mm

4 (a) $C_{\text{series}} = 3.54$ pF, $C = 3.9$ pF, $L = 48$ nH

4 (b) (i) series 3.03 pF, parallel 85.3 nH
(ii) 26.3 nH and 0.118λ
(iii) 3.79 pF and 0.449λ

4 (c) coax. + C = 5.6 pence

4 (d) Voltage refl. coeff. = 0.15