

Module 3F1, April 2009 – SIGNALS AND SYSTEMS – Answers

- 1 (a) Open-loop poles at $-0.5 \pm j0.8062$. Stable.
(b) $T(z) = K(z)/(z^2 + z + 0.9 + K(z))$.
(c) $-0.9 < k < 0.1$.
(d) For $-0.9 < k < 0.1$, $\lim_{n \rightarrow \infty} y_n = k/(2.9 + k)$.
(e) A.
- 2 (b) (ii) $g(x) = \sigma \sqrt{2/d}$.
- 3 (b) $Q_X = \frac{A^2}{3}$.
(d) $S_Y(\omega) = -4Q_X T \text{sinc}^2(\omega T/2) - 4Q_X T \text{sinc}^2(\omega T)$.
- 4 (b) $I(S_n; S_{n-1}) = 0.4282$ bits.
(c) $L = 1.3$ bits/sym.
(d) $L = 1.165$ bits/sym.