\[
P10: \quad 4.6(\beta) \text{ cf.} + \text{ext+}
\]
\[
G(s) = \frac{1 - e^{-sT}}{s} \cdot \frac{5}{s^2 + 2s + 2}
\]
\[
G(z) = \left(\frac{Z^{-1}}{z}\right) \cdot \frac{5}{s} \left[\frac{5}{s(s+1)^2} + z^2\right]
\]

From the tables, we have

\[
G(z) = \left(\frac{Z^{-1}}{z}\right) \cdot \left[\frac{5}{2} z(AZ + B)\right]
\]
\[
A = 1 - e^{-T(\cos T + \sin T)} = 0.0093
\]
\[
B = e^{2T} - e^{-T}(\sin T - \cos T) = 0.0087
\]
\[
\therefore G(z) = \frac{0.0234Z + 0.02187}{Z^2 - 1.8006Z + 0.8187}
\]
\[
C(z) = \frac{0.0234Z + 0.02187}{Z^2 - 1.8006Z + 0.8187} \cdot \frac{Z}{Z-1}
\]
\[
C(z) = \frac{A}{Z-1} + \frac{BZ + C}{Z^2 - 1.8006Z + 0.8187}
\]
\[
A = \frac{0.0234Z + 0.02187}{Z^2 - 1.8006Z + 0.8187} \bigg|_{z=1} = 2.5
\]
\[
0.0234Z + 0.0219 = A(z^2 - 1.8006Z + 0.8187) + (BZ + C)(Z-1)
\]
\[
Z^2: \quad 0 = A + B \Rightarrow B = -2.5
\]
\[
Z^0: \quad 0.02197 = 0.8187A - C \Rightarrow C = 0.02187 - 0.8187(2.5)
\]
\[
\therefore C(z) = \frac{2.5}{Z-1} + \frac{0.55Z + 2.55}{Z^2 - 2Z e^{-0.01} \cos 0.1 + e^{2T(z-1)}}
\]
\[
C(z) = 2.5 \cdot \frac{Z}{Z-1} + 2.5 \cdot \frac{-Z(z-0.9048)}{Z^2 - 1.8006Z + 0.8187} = \frac{0.2258}{0.0903Z} \bigg\| \frac{0.0903Z}{Z^2 - 1.8006Z + 0.8187}
\]
\[
C(z) = 2.5 - 2.5(0.9048)^n \cos (0.1n) - 2.5(0.9048)^n \sin (0.1n)
\]
\[
= 2.5 + 3.5535(0.9048)^n \cos (0.1n + 2.5z^2)
\]
(b) \[ M(s) = \frac{1}{s^2} \]
\[ C(s) = \frac{5}{s(s^2 + 2s + 1)} = \frac{5}{s^2} \frac{2}{s^2 + 1} \]
\[ c(t) = 5s \left[ 1 - e^{-t} \cos t + \sin t \right] u(t) \]
\[ = 5 \left[ 1 + 2e^{-t} \cos (t + 22.5) \right] u(t) \]
\[ c(t) = 2.5 + 3.535 e^{-0.1n} \cos (0.1n + 2.25) \]
\[ = 2.5 + 3.535 (0.948)^n \cos (0.1n + 22.5) \]

(c) \[ G_p(s) \bigg|_{s=0} = \frac{5}{2} = 2.5 \]
\[ G(z) \bigg|_{z=1} = \frac{0.0234 + 0.02187}{1-1.8066 + 0.8187} = 2.5 \]

(d) Same as (d) of part (a)