SEHS4653 Control System Analysis Suggested Answer for past exam paper (Semester 1, 2023/24)

Question 1(a)(i)
$y(t) = \frac{2}{3}(e^{-2t} - e^{-5t})$
Question 1(b)(i)
$A = \begin{bmatrix} 0 & 1 \\ -10 & -7 \end{bmatrix} \text{ and } B = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$
Question 1(b)(ii)
$=\frac{1}{s^2+7s+10}\begin{bmatrix}s+7 & 1\\-10 & s\end{bmatrix}$
Question 2
$G = \frac{G_1 G_2 G_3}{1 + G_2 H_3 + G_2 G_3 H_2 + G_1 G_2 G_3 H_1}$
Question 3(a)
$e(\infty) = \frac{1}{2}$
$M_P(\%) = 1.722\%$
Question 3(b)
$K = 0.0224, \ e(\infty) = 0.522$
Question 4(a)
0 < K < 90
Question 4(c)
$s = -1 \pm j1.73$
Question 5(b)
The gain margin = 12.5° The gain margin = 13 dB
Question 5(c)
The phase margin = 32° The gain margin = 7 dB